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# TEACHER'S MANUAL

## Part I.

FOR

# PRANG'S COMPLETE COURSE

IN

# FORM-STUDY AND DRAWING

## BOOKS I AND II.

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# TEACHER'S MANUAL

## Part I.

FOR

# PRANG'S COMPLETE COURSE

IN

# FORM-STUDY AND DRAWING

## Books I. and II.

BY

JOHN S. CLARK, MARY DANA HICKS
WALTER S. PERRY

THE PRANG EDUCATIONAL COMPANY
BOSTON NEW YORK CHICAGO

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# AUTHORS' PREFACE.

THIS course of instruction presents, not Form Study alone, not Drawing alone, but Form Study and Drawing as complementing each other, as together furnishing a means of mental development second to no other study, and indispensable in the education of every child, as leading to a knowledge and appreciation of the beautiful.

### FORM STUDY AND DRAWING IN MENTAL DEVELOPMENT.

Recognizing that the development of the mental powers in their natural order, leading to thought, requires not only perception, but also expression, the authors have arranged the work of this Course so that pupils shall first observe and study the forms of models and objects, and shall then express by drawing what they have observed in the forms of the models and objects studied. By the presentation of models of type forms, supplemented by familiar objects, the senses are addressed, the attention is awakened, the powers of observation are incited, the mind is stirred to action, thought ensues. Drawing is then introduced, not simply as a means of training the eye and hand, but as a language by which the pupil not only expresses but impresses his thought. Still further, in the "making" required in the study of the models and objects, the ability to use the hands is trained and encouraged, the creative faculties are developed, and thus manual training, with all its healthful influences, is begun. Pupils going through this Course will not only be led, through the cultivation of their observing powers, to take a lively interest in the forms of objects around them, but will also become conscious of the power of expressing their ideas of such forms by drawing, whether with regard to their facts as

seen in working-drawings, to their appearance as seen in pictures, or to their decoration; at the same time, while the eye has been trained to observe, and the hand to draw, the mind has been constantly unfolding through perception, thought, and expression.

## ART EDUCATION.

Still further, it is a distinct aim in this Course to lead pupils to an appreciation and love of the beautiful as found in Nature and as expressed in the hand-work of man. What man has done, what he has created, is Art. It is the belief of the authors that Art Education, or the study and the creation of the beautiful, should be begun with the earliest instruction of children; that while Nature is studied with reference to the facts to be observed, there is yet a truth, a beauty of Nature that transcends all particular or material manifestations; and that this truth or beauty is seen only when these particular manifestations, as embodied in form and color, are observed in their relations to the plan, the harmony, the unity that exist throughout Nature.

## DRAWING IN CONNECTION WITH OTHER STUDIES.

It is the hope also of the authors that the work in this Course may lead teachers and pupils to a free use of Drawing as an aid in other studies; and that through the constant connection, both in the Manual and in the Drawing-Books, between type forms and objects familiar to all, teachers and pupils may learn to look upon Drawing, not as subsisting in and for itself alone, but as a very important and ready means of awakening and conveying thought in the other subjects of the school curriculum. Drawing should be as much at the command of every teacher and every pupil as writing and speaking, and should be as freely used.

It is hoped, therefore, that teachers will seek every opportunity to carry the drawing out in broad applications in other studies, and will encourage pupils to use it as a means of expression generally in their school work.

## VALUABLE SUGGESTIONS.

The authors desire to acknowledge their obligations for valuable suggestions to Mrs. Hannah J. Carter, Director of the Art Department,

Drexel Institute, Philadelphia; Miss Josephine C. Locke, Supervisor of Drawing, Chicago; Prof. W. S. Goodnough, Supervisor of Drawing, Brooklyn, N. Y.; Miss Katherine E. Shattuck, Normal Class, Art Department, Pratt Institute, Brooklyn, N. Y.; Miss Ada M. Laughlin, Supervisor of Drawing, St. Paul, Minn.; Miss Sara A. Fawcett, Supervisor of Drawing, Newark, N. J.; Mrs. T. E. Riley, Supervisor of Drawing, St. Louis, Mo.

JOHN S. CLARK.
MARY DANA HICKS.
WALTER S. PERRY.

JANUARY 10, 1893.

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# PLAN OF THE SERIES.

THIS series comprises ten Drawing-Books, accompanied by five Manuals, Parts I.–V., which cover the work of the ten books. Each book contains, —

REGULAR DRAWING EXERCISES. OPTIONAL PAGES.

In connection with this work, preliminary practice is to be given by drill exercises, which, while taking but little time, are of the greatest importance in producing freedom of movement and confidence on the part of the pupil.

"Making," in connection with Form-Study and Drawing, is also of great importance. The Prang Pattern Sheets have been prepared to accompany the Drawing-Books of this Course, and are furnished with the books. Upon these sheets patterns are printed for the pupils to cut out and fold to make familiar forms. In these exercises a beginning is made in manual training. The forms thus made are to be used as objects of study and as models for drawing.

## NATURE OF THE WORK.

The exercises require, —

DRAWING FROM MODELS AND OBJECTS.
FROM DICTATION.
FROM WELL-CHOSEN COPIES.
FROM MEMORY.
ORIGINAL DESIGN.
MAKING MODELS AND OBJECTS.

Throughout the series the work is based upon the study of models, familiar objects, and natural forms. From the first, pupils learn to draw from real objects and not from copies of objects. As the sense of touch

furnishes one of the readiest means of ascertaining the form of an object, the lessons are so planned as to require handling of the models and objects by the pupils.

The work is strictly educational, — it deals with the mind; through the study of concrete objects thoughts are awakened which the hand and eye are trained to express. The imagination is cultivated, the sense of beauty is developed, and the expression of artistic ideas follows.

The models of type forms used in the first two primary years are studied by way of review, and ideas of form thus presented are expressed by drawing. More thoughtful work is now required in drawing, and the manner of presenting the work is adapted to the ability of the children using each book. Additional models and new objects are taken as the work advances.

### CHARACTER OF LINE IN DRAWING.

Particular attention is requested to the character of the lines in the drawing-books. They have the softness and quality of pencil lines. They furnish to pupils models of the lines desired from them, — lines showing freedom of movement, ready handling, and varying expression. Such lines require a soft pencil, — one not harder than an M grade.

### VALUE OF COPYING GOOD EXAMPLES.

It is desirable in this work not only that pupils should learn to express their own ideas of form, light and shade, grouping, etc., but that they should learn *good methods* of expression. They should also learn as much as possible of the elements of beauty from the best types of historic ornament. To these ends, exercises in copying good examples are made a part of the work.

# GENERAL DIRECTIONS.

In acquiring a knowledge of **Form**, there are three stages: Perception, Thought, Expression. Observation of Form requires **both** Perception and Thought. Expression of Form must of necessity be preceded by Observation. These general directions will therefore be classed under the two heads: Observation of Form and Expression of Form.

## OBSERVATION OF FORM.

### MODELS AND OBJECTS.

The term form will be used in this manual as including three dimensions, while figure or shape will be used as referring to only two dimensions. Both form and shape should be observed first in concrete objects. Hence the exercises in this series of books are based on the use of models and objects. The models are of the simple type forms, and are in both teacher's and pupils' sizes.

For the complete list see description at the end of the book.* The objects chosen are based on type forms, and are such as can be procured with very little trouble.

Every drawing exercise should begin with observation of the models or objects by the pupils. The directions under this head in each exercise are given to indicate to the teacher the manner in which the pupils should be led to observe (that is, to perceive and to think about) the form of models and objects.

Technical terms, which must be given by the teacher, should always **follow**, *not* precede, the observation of the form or figure to which the term applies.

### JUDGMENT OF SIZE AND PROPORTION.

The ability to judge correctly of size and proportion is of great importance, and should be carefully cultivated throughout all form study. An inch (generally expressed 1″) should be made the standard at first, later a foot (generally expressed 1′ 0″) may be introduced, and dimensions may be given in feet and inches. The teacher should in some way intro-

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* Where it is practicable, it will be of great advantage to have the pupils well supplied with models, so that each pupil may observe the model for himself through the hand by handling, placing, moving, etc., as well as by the eye.

duce into every exercise, whether from an object or from a copy, questions leading to judgment of definite length in inches, and also to judgment of the proportion of models, objects, and figures, by the consideration of the *relative* length of edges, of diameters, of profiles, and of lines.

### DEVELOPMENT OF IMAGINATION.

The value of the imagination in all conditions of life is too often forgotten. The teacher should have in mind constantly the development of the imagination. In studying a model, thought should be led from the model to its mental image, from that to its likeness in common objects, thence on to the possible action and uses of the model. Then in expressing the thought about the model by drawing, the imagination will again come in play and inspire not only the simple drawing of the model, but also the consideration of its various actions and modifications. Such imaginative work should be encouraged, but it should also be controlled.

## EXPRESSION OF FORM.

### VALUE AND METHOD.

Expression of form is doubly valuable, — on the one hand to the pupil, as a means of completing the study of the form; on the other hand to the teacher, as showing to what degree the pupil has received the idea of a form. There are three ways by which ideas of form can be expressed: by Making, by Drawing, by Language.

### MAKING.

Pupils can express their ideas of the form of a model or object most *completely* by making the model or object; therefore, throughout this series, frequent exercises are given in making objects as a part of the regular work. Modeling in clay is an admirable means of expression, and is not difficult as a class exercise. Directions for the management of clay can be found in "The Use of Models," and in the Primary Manuals, Parts I. and II., published by The Prang Educational Company. Teachers should encourage children in making simple objects in clay, paper, cloth, cardboard, wood, etc.

### CUTTING.

This exercise has been successfully introduced into many schools. Its object is, that children may learn to observe figures, not lines; that they may learn by doing; to give skill in using something besides a pencil; when colored paper is used, to aid in the study of color; to open new lines of thought; to create interest, — in short, more fully to educate the child. In some of the exercises it is directed that figures or designs cut from paper be pasted upon the page of the Drawing-Book. This gives variety to the work. To carry it out, the teacher has simply to pass about the room with a mucilage-brush and touch each book in one place, near the centre of the space the figure or design is to occupy; the pupil will then lay the design upon the page and press it down. In no case should a design or a piece of paper be pasted all over the back.

## DRAWING.

Training in position, pencil-holding, movement, and drawing, as indicated in the following directions, must be systematically pursued.

**Freedom of Movement.** — The importance of freedom of movement in drawing cannot be overestimated. It produces lightness of touch, quickness in execution, begets confidence in one's ability to draw, and when acquired by a class of pupils, materially lessens the work of the teacher. Experience among thousands of pupils shows conclusively that too much stress cannot be laid on the necessity for the early development of freedom of movement. The ability to sketch rapidly and easily an illustration of a thought awakened in the mind, cannot be attained without it.

A set of drawing-books, finished as draughtsmen would finish them rarely indicates the best teaching. It is of far more importance that the child should have opportunity to work first for freedom of movement rather than for straightness of line.

**Position.** — The children should sit on the left half of the seat facing the desk. They should sit erect, feet flat on the floor, the eyes never nearer the paper than is necessary for a clear view of the lines. They should not bend forward unnecessarily, and should learn to work at a distance.

**Book.** — The book should be directly in front of the pupil, pushed back on the desk, the long edges parallel to the long edges of the desk. NEVER TURN THE BOOK. To guard against undue rubbing or offsetting of the lines, and also to protect the page from any moisture of the hand, pupils should use a piece of cotton cloth the size of the page. While neatness in work should always be insisted on, bold freehand work should never be sacrificed for immaculate pages in the books.

**Pencil.** — The pencil should be of medium grade (The Prang School Pencil M is the proper grade) for all freehand work. It should be sharpened to a round but quite blunt point, and used for drawing only. When the pencil is worn away it should be lengthened by a pencil-holder. Short pencils should not be used.

The pencil should be held lightly *three* or *four inches* from the point, so that it will have the support of the middle finger and be held by the thumb and forefinger. Pencil-holding should be practiced by itself before beginning to draw.

**Pencil.** — The pencil should always be held at right angles to the line to be drawn when drawing straight lines, and at an angle of about 30° to the paper.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

**Drawing.** — Vertical lines should be drawn from top to bottom; horizontal lines from left to right; oblique lines, as a rule, from top to bottom.

Lines at the left and top should be drawn first, as a rule, though all parallel lines should be drawn in succession when practicable.

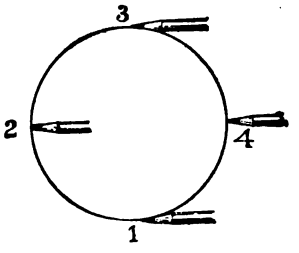



Fig. 5.

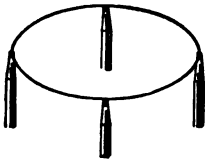


Fig. 6.

Circles and vertical ellipses should be drawn from the lower end of the imaginary vertical diameter, holding the pencil from left to right all the time. In drawing horizontal ellipses the pencil should be held as for a horizontal line. Circles, ellipses, and ovals should be sketched with one sweep of the pencil.

**Lines should be drawn continuously, without stopping or retracing.**

All curved lines, no matter how short, should be practiced over the printed copy before drawing.

**Erasing.** — All figures should be sketched with free movement without the use of the eraser. Pupils should erase together as a class, and should not be allowed to use the eraser when lining-in.

**Blackboard.** — Every opportunity possible for blackboard work should be given to the pupils.

## COLOR.

The use of color in the study of form will be found of great value. Color exercises are therefore suggested for each book. A general statement of principles and methods will be found on pages 86, 98–103. A fuller statement of principles and methods, together with a regular course of study in color and specific exercises, with many illustrations, will be found in "Suggestions for Instruction in Color."*

* Published by The Prang Educational Company.

# SUGGESTIONS TO TEACHERS

FOR

# THE USE OF THE MANUAL.

THE text for each exercise is divided into three parts, and each part has its special purpose. For the purpose of clear distinction each part is presented in a particular size of type.

**For information with regard to the subject and the special topic of the exercise,** the matter in large type should be studied. It will be noted that at the close of this part of the text, the special points to be developed with the class are given.

**For suggestive methods of developing in the minds of the pupils the ideas of the exercise,** the matter in smaller type headed "Study of Models by Pupils" and "Observation Exercise by Pupils" should be studied.

**For definite statements as to the drawing to be done,** the matter headed "Practice" and "Direction" should be studied.

It is earnestly hoped that teachers will not look upon the manual text either in its Suggestions or its Directions as something to be rigidly followed, but that they will strive to learn and apply the method and spirit of the work in the instruction of their classes. The attention of teachers is especially called to pages 3, 4, and 36, regarding the method and spirit of this work.

NOTE. — As pupils now receive in the first two years of school good instruction in Form-Study and Drawing, guide points and some illustrative diagrams necessary in the early edition of Drawing-Books I. to VI. are omitted in the later edition. It will be necessary, therefore, for teachers to make the slight adaptation in the instructions in the Manuals for the various exercises which is needed to meet the changed conditions. The drill exercises and practice pages, given in the Manuals as preceding the regular exercises, are to be drawn upon practice paper by pupils using the later edition.

# BOOK I.

## Models.

SOLIDS: Sphere, Hemisphere, Cube.
TABLETS: Circle, Semicircle, Square.
NATURAL FORMS: Apple, Plantain Leaf.
OBJECTS: Kite, Box.

## Decorative Figures.

QUATREFOIL, GREEK CROSS, ORIGINAL ARRANGEMENTS.

## Making.

TABLET-LAYING: Borders.
STICK-LAYING: Angles, Borders.
FROM A PATTERN: { Sphere, Cube, Box. / Circle, Square, Cross.

## Drawing.

PENCIL-HOLDING, MOVEMENT, LIGHT LINES, ERASING, BROAD GRAY LINES.

## Language.

(See page 64.)

NAMES OF MODELS AND DECORATIVE FIGURES AND THEIR DETAILS. TERMS OF LOCATION, DIRECTION, POSITION, SEEING, LENGTH, DIVISION, ARRANGEMENT.

## Color.

THE THREE PRIMARY PIGMENT COLORS.

## DRILL EXERCISES.

Drawing-Book, *page 1.*

**OBJECT. Practice for proper position of pupil and of paper; proper pencil-holding; free-arm movement from left to right, from top to bottom, and from corner to corner.**

**Practice Paper.** — It is desirable that pupils should have some practice in movement and drawing before beginning work in the Drawing-Book. For this purpose use sheets of manila practice paper, six by nine inches.* This practice paper will also be found useful for practice previous to many of the exercises throughout the Drawing-Book, as well as for folding. The sheets should be used upon both sides. Provision should be made for from twenty-five to thirty sheets for each pupil for use with one Drawing-Book.

**Drill Exercises Necessary.** — In order to draw well, two things are necessary, — a knowledge of the thing to be drawn, and skill of hand to draw. Study, then, not only the object to be drawn, but endeavor also to attain skill of hand to draw. The teacher should seek to become ready in drawing, and should carry out the exercises given to the pupils.

Skill of hand cannot be attained without repeated practice. It is not enough that the mind wills the hand; the muscles must be trained to obey. Hence, throughout this series frequent drill exercises are given to afford practice for proper pencil-holding, free movement, and ready drawing.

The first exercises chosen are simply in movement directly *from top to bottom, from left to right, from corner to corner,* and also *round and round;* they should be given first on practice paper, then in the Drawing-Book. The first steps preparatory to these exercises are very simple; but they are essential to success, and should therefore be practiced with great faithfulness.

**Books and Pencils.** — The name of the owner should be carefully written upon each Drawing-Book before the time of the lesson. The books should be placed in piles arranged according to the rows of pupils, that they may be ready for distribution when desired. The pencils should be sharpened to a blunt point, so that a broad line may be obtained. If the pencils have sharp points, they will make thin, hard, wiry lines, instead of the broad, soft, gray lines which are so much more pleasing.

**Pencil-holding.** — Before beginning work on the paper, give practice in pencil-holding. Let a monitor for each row place a pencil in the groove of each

* The paper is put up in packages of one hundred sheets, and may be obtained of booksellers and of The Prang Educational Company.

desk in the row, taking care to have each pencil point toward the left. Then give exercises as follows in taking up the pencil and in holding it properly: Hold up the left hand; take your pencil near the point with the thumb and first two fingers of the left hand; place the pencil between the thumb and first two fingers of the right hand, letting these grasp the pencil lightly near the middle. Thus the pencil will be quickly placed in the hand, and long pencil-holding will be insured. It will be well to have pupils lay down and take up their pencils together three or four times, so that the manner of doing it may be well understood.

**Movement.** — Free work both in movement and in drawing is of the greatest importance; for drawing, to be valuable, must be free and ready. Give practice in movement with the pencil from back to front on the desk, and see that *each pupil* holds the pencil at an angle of about 30° to the desk, and pointing directly to the left (see Fig. 1, page xii); the same for movement from left to right, the pencil at an angle of about 30°, and pointing toward the back of the desk (see Fig. 2, page xii); and from corner to corner (see Figs. 3 and 4, page xii). To keep the children together for movement, count as follows: One, back; two, back; three, back. Endeavor to make the whole movement continuous, unbroken; therefore count in even time.

**Practice.** — The books and practice paper, one sheet for each pupil, may now be distributed. The pupils may open their Drawing-Books at page 1, read the figures at the top and the letters at the left of the page. The points are an inch apart. The book may then be moved to the back of the desk, and the paper placed in front of the pupil, with long edges from left to right. Looking carefully at the inch in the Drawing-Book, each pupil may place a point that shall be an inch from the upper edge and from the left edge. Beginning at this point, lines an inch apart, and ending an inch from the lower edge, may be drawn down the paper at the count of the teacher, movement being practiced first. When counting for movement for straight lines and drawing combined, count as follows: One, back; two, back; three, ready; draw. The movement can be made as many times as seems desirable, — generally not less than three nor more than five times before drawing, — but the word for the last movement back should be *ready*, that pupils may be prepared to draw. Beginning again at the first point, lines an inch apart, and ending an inch from the right edge of the paper, may be drawn across the paper at the count of the teacher, movement being practiced first. Beginning at the first point again, a line may be drawn in a similar way to the lower left corner; and beginning at the upper right corner, a line may be drawn to the lower left corner. If it seems necessary, another sheet may be taken; pupils having placed the first point, may place light points an inch apart at the right of and also below the first point, and repeat the exercise on each side of the

sheet. The papers may now be gathered and carefully preserved, and work may be begun in the book. The directions below are to be given to the pupils.

**Length of Exercise.** — As the purpose of the drill exercises is to give practice in free movement and ready drawing, it would be a great mistake to make these exercises long. No one of the drill exercises given here should occupy ten minutes, and the best results in the end will be reached if not more than five minutes is spent. The children will soon become anxious to produce good work in the shortest space of time.

**Practice.** — Sit up straight, and with pencil in hand, held properly, begin at point 1, and move the hand down the page (without drawing and with the whole arm movement) as the teacher counts; then draw lightly down the page with one continuous movement. Repeat the movement and drawing, from points 1, 2, 3, 4, 5, 6, 7, 8, remembering to hold the pencil properly. *No erasing.* See illustration below of Drawing-Book, page 1, completed.

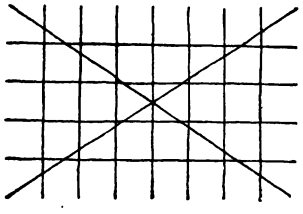
Draw from points *a*, *b*, *c*, *d*, *e*, across the page, remembering pencil-holding and movement as the teacher counts.

Draw also from the upper left to the lower right corner, and from the upper right to the lower left corner, with proper pencil-holding and movement. *No erasing.*

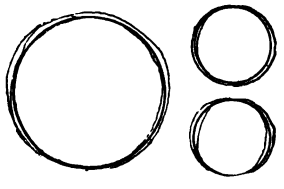
### Drawing-Book, *page 2.*

**OBJECT. Free-arm movement, and drawing round and round.**

**Free Movement.** — Give directions for holding the pencil for movement round and round, with the pencil pointing toward the left as if for drawing a vertical line, and for practicing the movement on the desk (see Fig. 5, p. xiii). The pencil must be held the same throughout the movement. Count, One, two, three, four, etc., counting but *one* for each circular movement. For the last complete movement before drawing, say *ready*. The counting will then be, One, two, three, ready, draw. After practicing the movement on the desk, the books can be distributed, and the following directions carried out.



**Drawing-Book, page 1, completed.**



**Drawing-Book, page 2, completed.**

**Directions.** — Practice movement, with proper pencil-holding, over the first printed circle without touching it, in the order 1, 2, 3, 4; then draw round and round on the printed circle. Repeat with the other circles. *No erasing.*

## EXERCISE I. — Sphere. — Its Outline. — Circle.

MODELS. *Sphere, Circle, and other Tablets.*

**OBJECT. To study the form of a sphere, to see its outline, and to draw its outline.**

IN preparing the Manual Text for the Drawing Books of Prang's Complete Course, the endeavor has been to meet all conditions.

In many cases where these books will be used, the regular teachers have been prepared for the work by training and experience, and the pupils have received instruction in the first two primary years of Form Study and Drawing according to the Primary Manual called "The Use of Models." In many other cases, the regular teachers who are called on to teach these books have had no opportunity to become acquainted with the method or the subject-matter of the primary work of "The Use of Models." Again, the children may not have had the primary instruction, or may have received it only to a very limited extent.

The text for these Manuals has therefore been prepared with a view to meeting the needs of both teachers and pupils who have not had previous practice or training. The text under each exercise will consist of two parts, the first part relating to the subject-matter necessary for the information of the teacher; the second part relating to the method of developing these ideas in the minds of the children. The exercises given for Study of the Model and for Observation by the pupils are given as suggestions. It is expected that teachers will supplement and vary these exercises by their own skill and tact and through their knowledge of child-nature. If the pupils are beginners in the work, the teacher must be careful to lead the children to such observation as will enable them to discover and recognize the leading characteristics of a form or of a detail before giving the name. If pupils have been already prepared in the work, the earlier exercises in the Drawing Books may be treated as review exercises by the teacher.

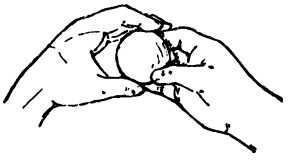
**The Sphere.** — The sphere is chosen as the first model for study, because it is the simplest and the best known of all type forms. It is smooth and pleasant to hold and handle, and always feels the same however you may turn it in your hand. Its outline always appears the same; for however you may turn or place the sphere, the outline is always a circle.

There are many objects like the sphere in form that are pleasantly familiar to all the pupils. Many fruits — the apple, the orange, the currant, the gooseberry, the peach, the cherry, the grape — are like the sphere in form. The playthings most preferred by children as well as those of larger growth are like the sphere. The reasons for this preference can be readily discovered. The ball when tossed or thrown

passes easily through the air, as it is round, and for the same reason it can be pleasantly caught and grasped. The marble rolls so readily that a slight shot with the thumb sends it to its destination. The croquet-ball obeys the mallet quickly because it will roll in any direction in which it is impelled. If in studying form, as in other things, we should begin with the known, the sphere should be our first model. The sphere will prove as pleasant a companion to the children in study as in play.

The method of the teacher should always be to lead the children to discover and express for themselves all that they can about the form to be studied. Thus they will become both receptive and expressive. Therefore do not tell the children what they can find out; direct their observations, their thoughts, and their expressions, however, by skilful questions and exercises; remember also that drawing, as well as language, is a means of expression. The following exercises are given as suggestions; in order to carry them out well, see that each pupil has a model, so that each one can study and discover by touch as well as by sight. Do not give a question that will lead a pupil to repeat what you have said, but give questions that will lead to thought on the part of the pupil. Be careful always to obtain a complete sentence as an answer to any question.

**To be developed. — Form of model; use of name, sphere; part visible; shape of outline; circle; objects like sphere; drawing; quality of line.**



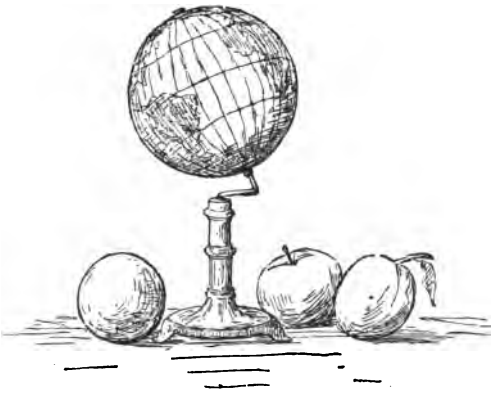
**Suggestions for Study of the Model by Pupils.** — Handle and grasp the model; how does it feel? What is it called? (*It is called a sphere.*)

How much of the sphere can you see without turning it? Show with the fingers, and tell what part can be seen, and what part cannot be seen. (*The part of the sphere toward you can be seen, the part away from you cannot be seen.*)

Trace with the fingers on the sphere the outline of the part that can be seen; trace the outline in the air. All trace the outline in the air; what is the shape of the outline? (*The shape of the outline of the sphere is round; it is like the outline of a circle.*) Find a tablet having the shape of a circle, among several tablets of different shapes.

**Drawing-Book, *page 3.* — Drawing the outline of a Sphere.**

**Observation Exercises for Pupils.** — What do the pictures in the drawing-book represent? How are the objects represented like the sphere? How are they unlike the sphere? How large is the picture of the sphere? of the ball? of the orange?



Mention other objects spherical in form, — objects in the room, objects in your pockets, objects that you can remember.

Can any one make a sphere at home? *

**Directions.** — The outline of a sphere is represented in the drawing-book by Fig. 1. Draw lightly an outline of a sphere, at the right, of the same size.

In drawing the outline, practice movement first on the printed copy, then over the given points; then draw lightly the circle at one sweep.

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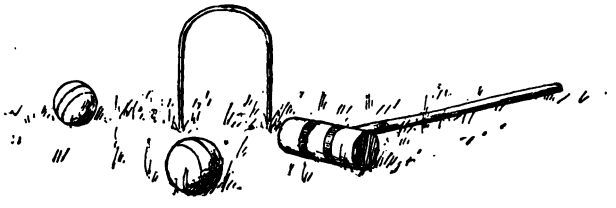
* On Prang's Pattern Sheet, No. 1, there will be found two patterns to be put together to make a ball cover. By the aid of these patterns, a ball cover can be cut from any suitable material and sewed together about a ball of yarn.



## EXERCISE II. — Cube. — Drawing the Pattern.

MODELS: *Sphere, Cube, Square.*

**OBJECT. To study the general form of a cube; to work out the pattern of a cube; to draw the pattern; to make a hollow cube.**

**The Cube.** — The second model taken is the cube, because it is the most simple type form next to the sphere. It is also the type form which is the most like and the most unlike the sphere, with which it should be compared. All knowledge is based upon comparison.

The cube is like the sphere in that it measures alike from top to bottom, from left to right, and from front to back. But the cube also differs from the sphere. The sphere is round and is therefore pleasant to hold; the cube has edges and corners and therefore, when grasped, will cut and prick the hand. The outside or **surface** of the sphere is unbroken by an edge; the surface therefore has but one part. The surface of the cube is broken by edges and thus divided into six parts. A part of a surface unbroken by an edge is called a **face.** The sphere then has one face; the cube has six faces. The shape of the outline of the sphere is like the outline of a circle; the shape of each face of the cube is square. We speak of the **form** of an object as including three dimensions, of **shape** when we wish to include but two dimensions. It is necessary to be very careful in the use of these two words.

The sphere seems the symbol of motion; the cube, on the contrary, represents rest, as it stands so firmly, and does not, like the sphere, move at a very light touch. The faces are all alike, and it can stand on any face. Therefore cubes can be placed side by side or built up so as to match and form a regular structure. Hence we find this form among the building-blocks of children.

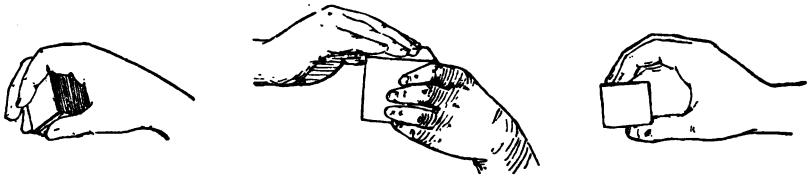
As the cube is so compact and so regular, it is a favorite form in many ways. Lumps of sugar, caramels, etc., are like cubes in form; many boxes, baskets, hat-trunks, inkstands, are like cubes; kitchen stoves frequently have this general form.

**To be developed. — Form of model; use of name, cube; surface; face; shape of face; pattern of cube; drawing pattern; quality of line; making hollow cube.**

**Suggestions for Study of the Models by the Pupils.** — Hold the sphere in one hand, and the new model in the other; how does the model feel? What do you feel? (*I feel corners, edges.*) What is the model called?

Hold the cube in the right hand, strike it gently in the palm of the left, and *vice versa.* What part of the cube are you touching? (*I am touching the outside of the cube.*) What is the outside of anything called? (*It is called the surface.*) Pass the fingers over the top of the cube, showing how far it extends; pass the fingers over the front, showing

how far it extends. How many parts has the surface of a cube? (*The surface of a cube has six parts; these parts are called faces.*) Hold the model so as to see but one face; what is the shape of the face? (*The face is square.*) Find a tablet of this shape.



**The Pattern.** — Patterns are used for making almost all of the articles by which we are surrounded. Clothing, house draperies, furniture coverings, etc., all these are made from patterns. A pattern is anything cut or drawn or formed, to be used as a guide in making an object and serving to determine its exact form and dimensions. Patterns are of two kinds, flat and solid. Flat patterns are used for making articles of cloth and other textile fabrics, as dresses, coats, curtains, bags, etc. They are also used by workers in leather and other thin materials, for cutting out work, as sheet tin or iron, for dippers, basins, etc., and for making boxes and other articles of pasteboard.

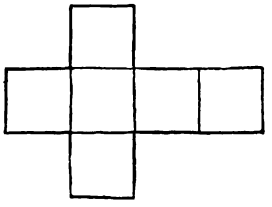
Solid patterns are used for making the molds for casting metals. Car wheels, iron ware, cannon balls, stoves — in fact, most of our machinery — are cast in iron from molds made from patterns. The commoner kind of glassware is made in molds, and for these molds also a pattern is needed.

Work out the pattern, draw it, and make a hollow cube from the pattern, before giving it to the class. By doing this, you will be able to give every step intelligently and clearly.

**Working out the Pattern from the Model.** — What is a *pattern?* Can you mention something made from a pattern? (*Iron castings, — anything made of cast metal is made from a pattern.*) Such things are made from solid patterns; the cube might be a pattern for iron-casting. Can you mention something made from flat patterns? (*Dresses, clothing, — anything made of cloth or leather; dippers, basins, — anything made of sheet metal, tin, iron, etc.; boxes, cardboard houses, etc., — anything made of pasteboard or paper: all these are made from patterns.*) What are patterns for?

We want to make a *hollow* paper cube of this size; what must we have so as to get the right form and size? (*We must have a pattern.*) Must it be a solid or a flat pattern? (*The pattern must be flat.*) Let us try to find out what the shape of the pattern will be. Turn the cube over in your hand. How many faces has it, and what is their shape? (*The cube has six square faces.*) What must your pattern have, then? (*The pattern must have six squares.*)

Place on the desk a sheet of paper, the long edges from left to right. Place the cube on it, half-way down the sheet, a little to the left of the centre. Crease the paper around the bottom face. Take up the cube. What have you creased in the paper? (*I have creased a square, the pattern of the bottom face.*) Put the cube back on the square, fold the paper over it, and crease the other faces.



**Drawing-Book, *page 4.* — Drawing the Pattern of a Cube.**

**Observation Exercises for Pupils.** — What are Figs. 1, 2, and 3? Turn the book sideways. What is the shape of Fig. 1? (*The shape of Fig. 1 is that of the cross.*) Suppose that you wished to make a hollow cube open at the top, without any top face, what would be the shape of the pattern? (*The shape of the pattern would be that of a cross with equal arms.*)

**Directions.** — The printed square shows the place of the bottom face in the pattern to be drawn.

Draw the pattern as in Fig. 1, using the point given at the left and that given above. Draw the long horizontals indefinitely right over the printed lines, then the verticals, finishing with the shorter verticals and horizontals. Finish the outline of the pattern in broad, soft gray lines.

**Prang's Pattern Sheet, No. 1.* — Making a hollow Cube.**

What is printed on the Pattern Sheet? (*The pattern of a cube, Fig. 1, is printed on the page.*) What besides? (*Figs. 2 and 3 are patterns to be put together to make a ball-cover.*)

(The teacher speaks of the laps on the pattern of the cube, and their use in making a cube, — to be pasted so as to hold the faces of the cube together.)

Cut out the pattern, Fig. 1, taking care not to cut off the laps, fold it so as to make a cube, and paste it together.

Cut out the patterns, Figs. 2 and 3 take them home, and use them as patterns for the cover of a ball.

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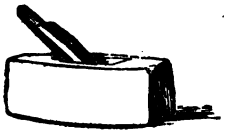
* The pattern sheets are provided so that accurate models may be made. Where instruments are provided for children, it will be much better for them to lay out and draw their own patterns, instead of using the printed patterns. The publishers will be pleased to furnish blank cardboard instead of the patterns when it is desired.

## EXERCISE III. — Four Views of a Cube. — Outlines of Different Faces. — Square.

MODELS: *Sphere, Cube, Circle, Square.*

**OBJECT. To study a cube as to faces, edges, and corners; to see and to draw the outlines of different faces.**

THE study of the cube should still be pursued by contrast with the sphere. The sphere has but one face, and this face is equally round in every direction. It is called a **round** face. The surface of the cube is divided into six faces, — the *front* face, the *back* face, the *left* face, the *right* face, the *top* face, the *bottom* face. These faces are all perfectly flat, such as would be made by a carpenter's plane. Such faces are called **plane** faces. The name of the kind of face, *plane*, and the name of the carpenter's tool, *plane*, are both taken from the same Latin word, *planus*, meaning flat.



In whatever position the sphere is held, but one half of it can be seen. How much of the cube can be seen depends upon its position in relation to the eye. It can be held so that one, two, or three faces may be seen. If held at arm's length, directly opposite the eyes with a face toward you, but one face is visible. Raise or lower the cube a little, and two faces are visible. If the cube is held opposite the eyes with an edge toward you, two faces are visible; if raised or lowered while in this position, three faces are visible. When the cube is held so that the front face can be seen squarely, the cube is said to be **facing**; otherwise it is said to be **turned.**

The visible portion of the sphere always appears, in outline, round like a circle. The visible faces of the cube do not always appear square. When more than one face is visible, they appear somewhat modified in shape. When placed so that but one face is visible, that face appears square.

The six faces of the cube are all square and equal in size. Its twelve edges are straight and equal in length. When the cube is placed upon a perfectly level surface it has four *upright* or **vertical** faces, and two *level* or **horizontal** faces. The edges forming the sides of the vertical faces are vertical edges; those bounding the horizontal faces are horizontal edges. Hence, when in this position, the cube has four vertical edges and eight horizontal edges. The vertical edges extend directly up and down. The horizontal edges extend from back to front or from left to right. Note this, as the mistake is frequently made of supposing that horizontal edges extend only from left to right. All *level* edges are *horizontal* edges.

It will be noticed that in speaking of the circle, as in Exercise I., and of the square, as in Exercises II. and III., no attention has been given to the special char-

acteristics of a circle or a square. This has been done intentionally, as it seems better that the first impressions of figures should be of them as *wholes*. When the impression of a form or of a figure as a whole is well fixed, it may be taken up in detail. At present, all that is necessary to be developed about these two figures is that every part of the outline of the circle bends or curves equally, and that the four sides of the square are straight and equal.

The following résumé will bring before the teacher the points of resemblance and difference between the sphere and the cube: —

SPHERE AND CUBE COMPARED.

| **Type form.** | **Sphere.** | **Cube.** |
|---|---|---|
| Nature. | Ready to move. | Ready to stand. |
| Outside or surface. | No edges, no corners. | Edges and corners. |
| Kind of surface. | Round. | Broken by edges, but wholly plane. |
| Parts of surface or faces. | One face. | Six faces. |
| Shape of faces. | In outline like a circle. | Square. |
| Part visible. | Half of its face. | One, two, or three faces, according to position. |

Study the models by touch and sight, and draw this exercise before giving it to the pupils, thus gaining through your own experience a knowledge of what you wish them to discover and to do. This exercise calls for the drawing of the different faces of a cube. The same drawings would represent the different *views* of the cube in this position (see Exercise IV., page 14, on *views*). The terms *faces* and *views* cannot, however, be used interchangeably. In many models, in their different positions, the drawing of a certain view of a face would be very different from the drawing of the face itself, which is always made as if in front view.

**To be developed. — Faces, round, plane; edges, corners; part visible; facing, turned; vertical, horizontal; square; objects like cube; drawing; quality of line.**

**Suggestions for Study of the Models by the Pupils.** — Handle and grasp the models. Compare them. How many faces has the sphere? (*The sphere has one face.*) Pass your finger over it in every direction. What can you say about it? (*It is equally round in every direction.*) What is such a face called? (*It is called a round face.*)

How many faces has the cube? Pass your fingers over them. How do they feel? (*They feel flat.*) What do we call a flat face? (*We call it plane.*) Do all the faces of the cube feel alike? How do the faces of the cube compare in size? Pass your fingers over one face; over to an adjoining face. What do you find? How many edges has a cube? How many corners has a cube?

Hold up the sphere. How much of it do you see? What is the shape of what you see? Move it to some other position and observe it. Move it again. What can you say

about it? (*The sphere always appears the same.*) Hold the cube at arm's length directly in front of the eyes, and with a face toward you. What do you see? Lower it; how many faces do you see? Hold it so as to see three faces.

Place the cube on the level part of your desk. Move your fingers over the faces of the cube. Find all the faces on which you can move your fingers up and down. What is the position of these faces? (*These faces are upright or vertical.*) Move your fingers over the top face. How many of its faces are level? What are these level faces called? (*They are called horizontal faces.*)

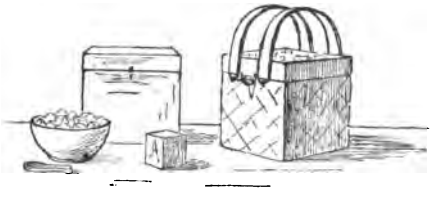
Observe the front face of the cube; move the fingers on the left and right edges; how did they move? (*They moved from top to bottom, vertically.*) All trace the direction in the air. Observe and trace the *horizontal* edges.

Find a tablet like the outline of the sphere; what is the shape called? Find a tablet like a face of the cube; what is it called? Place the circle on the square; what can you tell of the edges of each?

**Drawing-Book, *page 5.*— Drawing the outlines of different faces of a Cube.**

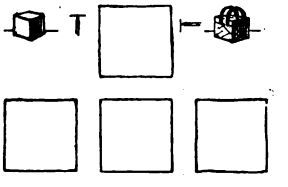
**Observation Exercises for Pupils.** — Open the books. What do the pictures represent?

Mention objects like a cube. Can any one make a cube, or an object like a cube? Point out the front face of the cube; what is its shape? the left face, its shape? the top and right faces, their shape? How do the faces compare in size? How do the edges of the left face, of the top face, of the right face, compare with those of the front face? How do the edges of the front face compare with each other? of the top face? of the left face? of the right face?



**Directions.** — The front face of a cube is given in the drawing-book. Draw the left, top, and right faces, using the angles given. In all figures draw by parallels when possible. Therefore the general order in drawing a square is — left side, right side, upper side, lower side. (Movement for each line should be practiced before drawing, the teacher counting as directed on page 3.)

This order can be followed readily in drawing the left face, as the angles are all given. While drawing the top and right faces, remember that the lines must be all equal in length. Do not place points, but think the length of each line while moving and drawing.



**Drawing-Book, page 5, completed.**

## EXERCISE IV. — Two Views of a Hemisphere. — Top View, Front View.

MODELS: *Sphere, Cube, Hemisphere, Semicircle.*

**OBJECT. To study the form of a hemisphere; to see and to draw the outline of its top view and of its front view.**

**The Hemisphere.** — As the study of the cylinder, connecting that of the sphere and cube, has been thoroughly given in the primary manual, The Use of Models, it is thought best to vary the order here.

The hemisphere is taken up next. It is readily developed from the sphere by bisecting it. A hemisphere is half of a sphere. It should be studied by comparing it with the sphere and the cube. The sphere has one face, the hemisphere has two faces. The hemisphere will stand on either face, will slide on one face, will rock on one face, but it will not roll. One face is similar to the face of the sphere, but because it is not completely round, it is called **rounding**, not round. The other face of the hemisphere is plane, like the faces of the cube. The shape of the plane face of the hemisphere is a circle.

The sphere has no edges; the cube has twelve edges. The hemisphere has one edge. The edges of the cube are straight; the edge of the hemisphere is **curved.**

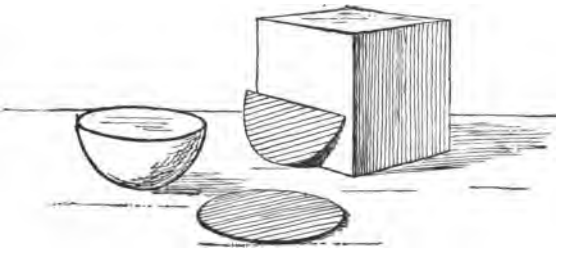
The hemisphere is said to be in its normal position when resting on its plane face; if it rests upon its rounding face, the hemisphere is said to be inverted. If the hemisphere is placed upon its plane face, and you look directly down upon it, the outline of what you see is like the outline of a circle. In looking directly down upon it you obtain a **top view.** This view gives you some of the facts of the hemisphere. It shows you the actual dimensions of the plane face and its actual outline.

Raise the model to the level of the eyes, letting it still rest on its plane face. The outline of what you see now is like the outline of half a circle, called a **semicircle.** When held directly in front of the eyes on a level with them the **front view** is obtained. This shows some more facts of the hemisphere; it shows its actual height and the outline of its rounding face.

This use of the term **view** is technical, and is to be distinguished from the colloquial use of the same word which is applied to any aspect of an object. A geometric view shows certain facts of an object as they are, as measurement will prove them to be. To obtain a *top view* the object must be held directly beneath the eye; for a *front view* the object must be on a level with the eye and directly opposite to it. Move the object from these positions, and an apparent change takes

place in the outline; you are no longer observing its facts but its appearance, which varies with every change of position. It will be seen here that while the outline of the top *view* is the same as the outline of the rounding *face* of the hemisphere, the outline of the front view differs decidedly from the outline of the rounding *face*. This is an example of the possible difference between *face* and *view*.

The form of the hemisphere is naturally more often seen in divided objects than elsewhere, — half-fruits of various kinds; but it is also met in many manufactured objects; dishes, bowls, kettles, ladles, are frequently like a hemisphere in outline; also buttons, caps, lamp-shades. It is important that the children should be led to find the form studied in objects around them, because, on the one hand, the resemblance serves to interest them in the type form itself and to fix it in their minds; and, on the other hand, it tends to make their knowledge of form real and vital, as being a component part of all their surroundings.



**To be developed. — Form of model; use of name, hemisphere; rounding face; view; top view, front view; semicircle; curved edge, straight edge; curved line, straight line; objects like hemisphere; drawing; quality of line.**

**Suggestions for Study of the Hemisphere by Pupils.** — How many faces has this model? (*The model has two faces.*) How do they differ? (*One is rounding and one is plane.*) What is the model like? (*It is like half a sphere.*) What is it called?

Place the plane face of the hemisphere on a book, and look directly down upon it. What part of the hemisphere is in view? (*The top of the hemisphere is in view.*) What view of the hemisphere have you when you look directly down upon the top? (*I have the top view.*) What is the shape of the top view? (*The shape of the top view is like a circle.*) (*Front view*, and its shape *semicircle*, brought out in the same way.) Find a tablet having the shape of the front view.

(*Curved* and *straight edge* should be brought out through movement on the edges of the hemisphere and cube and of the semicircle.) Draw the top view and the front view of the hemisphere on the blackboard. See illustration, page 19. What figures have you made? What kinds of lines are there? (*There are curved and straight lines.*)

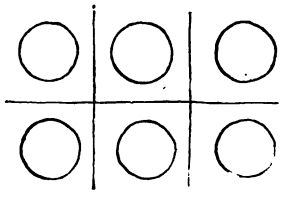
**Drawing-Book, *page 7.*—Drawing the outline of the front view of the Hemisphere.**

**Observation Exercises for Pupils.** — What do the pictures in the drawing-book represent? Can you mention objects like a hemisphere? Can any one make and bring to school an object like a hemisphere? Look down on the model to get a top view; what is its shape? Observe the front view in the same manner.

The top view of a hemisphere is given; the front view is required below. How wide is the top view? (*The top view is three inches wide.*) How wide is the front view? (*The front view is as wide as the top view.*) How high is the front view? (*The front view is half as high as it is wide.*) How many inches is this?

**Bisecting.** — Take a sheet of paper. Fold the left edge over to meet the right edge Crease the fold firmly, and detach carefully on the fold. (The teacher recalls the term *bisect*, to divide into two equal parts.) Bisect the edges of the part detached in the same way until the term is well understood.

**Drawing-Book, *page 6.*—Drill Exercise. Practice page for Exercise IV.**



**Drawing-Book, page 6, completed.**

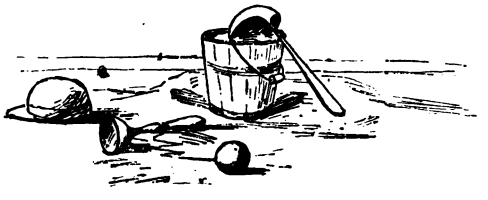
**Practice.** — Draw with free-arm movement lines from *b* and *c* down the page and a line from *a* across the page, dividing it into six parts.

In the upper left-hand space, beginning at 1, and moving in the direction 1, 2, 3, 4, 1, 2, etc. (see page xiii), practice the movement for a circle, as large as the space will allow, then draw a circle with one sweep; repeat in the other spaces. Pay special attention to pencil-holding, always pointing the pencil toward the left, and draw with free movement from the shoulder. *No erasing.*

**Directions, page 7.** — Draw the top view through the given points, first practicing for movement; draw the front view below the top view, using the given points.

First draw a horizontal for the *base* of the semicircle. Place a point in the middle of the horizontal (*bisect* it); then place a point as far above the point of bisection as half the length of the line for the *altitude* of the curve. Beginning at 1, practice movement for a circle, then draw the semicircle.

See page 19 for the illustration of Exercise IV.

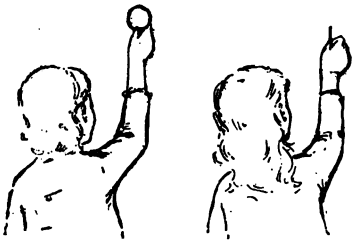


## EXERCISE V. — Circular Tablet. — Five Views.

MODEL: *Circular Tablet.*

**OBJECT. To study the shape of a circular tablet; to cut it out; to see and to draw its face view, its edge view.**

**Circular Tablet.** — The circular tablet may be studied in regard to its views, and the difference between different *views* is well emphasized here. Hold the tablet vertical, facing, and directly opposite the eye at arm's length. This gives you the front view, the outline of which is a circle. Move it down to the waist, so that you look directly down upon it. This gives you the top edge view, showing the fact of the distance from left to right, which is equal to the diameter of the tablet. For the bottom edge view, hold the tablet vertical directly above the head. If you hold the tablet in the right hand, with the arm stretched straight out to the right from the shoulder, you will obtain a left-edge view of it. For a right-edge view, hold it in the same way in the left hand. In all of these views only the edge is visible, showing the same length as the diameter of the tablet. In making the drawings to show these five views, care should be taken to show in the drawings the true relative positions of the views. After drawing the front view, which is a circle, the top view should be placed directly above it, the bottom view directly below it, and the left and right views (all straight lines) should be placed directly to the left and right of the front view. See the illustration on page 19 of Drawing-Book, page 7, completed. Drawing on the blackboard should be frequently practiced by both pupils and teachers.



**To be developed.** — Tablet, face, edge; top, bottom, left, right views; drawing the views; quality of line; color, yellow or orange.

**Suggestions for Study of the Model by the Pupils.** — Take the circular tablet. Find its face, find its edge. Hold the tablet facing you; what is its shape? What would you draw for the outline?

Look at the edge in various parts to see if the paper is thick or thin, — if it has the same thickness everywhere; hold it so as to look at the edge from the top, from the bottom, from the left, from the right; draw on the board the face view of the tablet, and its top, bottom, left, and right edge views. All this work is intended for pupils.

**Color** having been accepted by leading educators as an important means of acquainting a child with his surroundings and of promoting his mental development, some provision should be made in all schools for its study. An opportunity for a short exercise in color is here afforded.

In all schemes for color-lessons, the color sense should be made the starting-point. Be careful therefore always to present a color first and allow the children to receive the color impression or sensation. After the children have found other examples of the same color, then give the name of the color. Only those names which are in common use should be given to primary children. Yellow, red, blue, orange, green, violet, purple, brown, gray, crimson are quite sufficient for them.

Before giving this exercise to the class, work out every step with care, studying the circular tablet in its different views, cutting the colored circle, pasting it, and drawing the views. As you attain accuracy and skill you will learn how to lead your pupils to develop these forms. Make your standard as to neatness, care, and accuracy in cutting and making, very high from the first. In cutting a circle, it will be found helpful to give a slight rotary movement to the paper as well as to the scissors. Scissors should be a part of the outfit of every elementary school. Cutting various figures from colored paper is a valuable aid in training the color sense. During the process of cutting, the eye of the child is being filled with the color, and his standard of the color is being formed. It is, therefore, of the utmost importance that the colored papers used should be of good color; it will not do to use any color that may be at hand. The purpose of the exercises where cutting from colored paper is used is not only to render the exercise more real and of greater interest to the child, but also steadily to cultivate his color sense, giving him good standards of the principal positive colors. This will prepare for the study of hues, tints, shades, and other modifications. In order to study these modifications properly and also the harmony of color, the foundation colors must be right.* These colors must not be considered by themselves, but in their relation to each other.

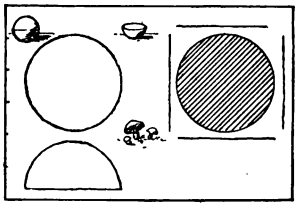
Where teachers are prepared by previous training in water-color, and where the conditions are such that the children can be supplied with good material, the use of water-colors and the brush is suggested.

* Mr. Louis Prang has been working, as is well known, for years at the color problem. After repeated patient, long-continued study and experiments, the preparation of good colored papers adapted to the cultivation of the color sense has been undertaken. Prang's Colored Papers for the positive colors, tints, and shades are now ready and can be obtained through the Prang Educational Company.

**Observation Exercise in Color.** — Look at this piece of colored paper. (The teacher holds up a piece of yellow paper so that all can see.) Can you see anything in the room of this color? Can you see anything else? anything else? Can you think of anything of this color? Can you tell me the name of the color? (Three-inch squares of manila paper and of yellow * paper distributed, — one of each to each pupil.) Compare the two squares as to size. Compare the manila square with the circle in the drawing-book as to size. Which is wider, the circle or the square? Which is higher? Cut a circle very carefully from the manila square. Compare it with the printed circle. Cut now a circle from the yellow square.

**Drawing-Book, *page 7.* — Drawing the edge views of a circular tablet.**

**Study of the Colored Circle.** — Hold up the yellow circle. What would you draw for its face view? its left view? its right view? its top view? its bottom view? Paste the yellow circle in the drawing-book to cover the printed circle.



**Drawing-Book, page 7, completed.**

**Directions.** — Draw the top view, bottom view, left-edge view, right-edge view. Points are given for the top and left-edge views. How long should each edge view be? Think the right length of the line as you move and draw

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* Yellow is taken on the supposition that the children have had no previous color training. If they have had training in yellow, red, and blue, then give orange for this lesson.

## EXERCISE VI. — Sphere on Cube. — Hemisphere on Cube. — Front Views.

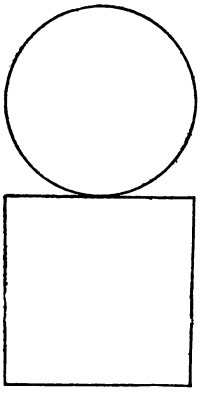
MODELS: *Sphere, Cube, Hemisphere.*

**OBJECT. To study and to draw the front view of a combination of two models.**

**Combination of Models.** — It is well to begin early to study combinations of two or more models made either by building up or by arranging beside each other. In this exercise the models are presented as built up two by two.

**A Sphere on a Cube — Front View.** — As has been said, in studying an object to obtain a geometric view, the object must be exactly opposite the eye. It is of course impossible to place an object so that every part is exactly opposite the eye. It will be sufficient if care is taken to place the object so that the centre of the part visible will be opposite the eye; the other parts will then be as nearly opposite the eye as possible.

The same rule holds, in general, with regard to a combination of models. That is to say, in studying a combination of models, to obtain a front view, the combination must be so placed that the centre of the combination will be opposite the eye. The first combination given is that of the sphere so placed that it rests upon the centre of the top face of the cube, and the front view is required. The models, then, must be held so that the upper edge of the front face of the cube will be opposite the eye.

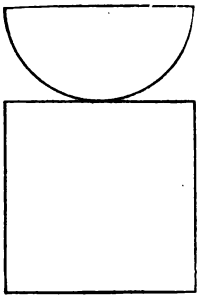


Any view of the sphere is in outline like a circle; the front view of a cube, facing, is a square. The front view of this combination will therefore be represented by a circle resting on the middle of the upper side of a square.

**A Hemisphere on a Cube — Front View.** — In the previous paragraph the statement was made that in studying a combination of models or objects for a geometric view, the combination must generally be placed so that its centre will be opposite the eye. The present combination is one of the exceptions to this rule. Place the inverted hemisphere on the cube. Hold this combination so that its centre will be on a level with the eye. It will be seen that the centre of this combination will be below the upper edge of the front face of the cube. It will also be seen that the upper edge of the front face of the cube hides the lower part of the hemisphere, that the full height of the hemisphere is not visible, and that therefore all the facts that should be studied in a front view cannot be seen. Hence it will be necessary to lower the combination until the upper edge of the cube is exactly on a level with the eye; then the full height of the hemisphere can be seen. The front view of this

combination will be represented by an inverted semicircle resting on the middle of the upper side of a square.

It must be remembered that in drawing a semicircle, it is better always to *move* for a whole circle and then draw only the semicircle, without breaking or discontinuing the movement in the least. Correct movement for a circle is easily apprehended and gained by the child; the semicircle alone is much more difficult.



Study and draw the two combinations according to the suggestions given. Remember that in drawing either the circle, semicircle, or the square, the movement and drawing must be made from the shoulder, without bending the arm or the wrist.

**Other Models.** — If the pupils have had two years training in "The Use of Models," and have learned to know the twelve type solids, other combinations may be made here, — the ellipsoid or ovoid on the square prism; the cone, pyramid, or vase form on the cube.

**To be developed.** — **Combination of models; placing combination for front view; drawing by parallels or opposites; quality of line.**

**Suggestions for Study of the Models by Pupils.** — Hold the cube with the right hand, place the sphere upon it with the left, and raise the two models until the upper front edge of the cube is opposite the eye. What view of the models have you? What would you draw for the front view? (*I would draw a square with a circle resting on the square.*) At what point should the circle touch the square? (*The circle should touch the square at the centre of the upper side.*) How should the circle and square compare in width and height? (*They should be the same.*) Place the hemisphere on the cube and study the front view in the same way.

**Drawing-Book, *page 8.* — Drawing the Front Views.**

**Order of Drawing. — Pencil-Holding.** — In what order should the lines of a square be drawn? (*The lines of a square should be drawn by parallels, — first the left, then the right, then the upper, then the lower line.*) Show me pencil-holding for a vertical line. (The pupils take the pencils — see page 2 — and hold them up, pointing toward the left, high enough for the teacher to see.) Show me pencil-holding for a horizontal line. (The pupils hold up the pencils, pointing forward.) Show me pencil-holding for a circle.

**Directions.** — Draw the front view of the cube, using the angles given. Above and touching it, draw the front view of the sphere. On the right half of the page draw the front view of the cube again, using the angle given. Above and touching it, draw the front view of the hemisphere. Always, before drawing any line, practice free-arm movement from the shoulder in the direction of the line to be drawn.

## EXERCISE VII. — Sphere on Cube. — Further Study.

MODELS: *Sphere, Cube.*

**OBJECT. To study a group of two models as to their appearance below the eye; also as to the top view.**

THE text for this lesson is long, not because it is a difficult lesson for the pupils, but because it brings up several topics which are new to many teachers.

**Facts and Appearance.** — When the geometric views of a model or object are studied, the *facts* of its form are obtained. Thus the top view of the cube facing gives the *facts* of its width from left to right and of its width from front to back; the front view gives also the fact of its width from left to right, and in addition the fact of its height; the two views studied together give the facts of its height, its width from left to right and from front to back. The top view of the hemisphere gives the facts of its width from left to right and of its width from front to back; the front view also gives the fact of its width from left to right and in addition the fact of its height; the two views give the facts of its height, its width from left to right and from front to back.

There are, however, other aspects of models and objects, besides geometric views, which are worth studying. Every model or object, except the sphere, presents a different aspect according to the position in which it is observed. The sphere appears always the same in outline. But take the cube. You have already observed that it can be held so that one, two, or three faces can be seen; in each case its outline must be different from its outline in the other cases. Hold the cube directly beneath the eyes and look down upon it, so as to obtain the top view, a square. Hold it at arm's length directly opposite the eyes, so as to obtain the front view. Now lower the cube slightly, holding it still at arm's length, you will get a glimpse of the top face, but *appearing* not like a square as in the top view. You know that the top face of the cube is a square, but it does not *appear* so to you now. In studying the top face in this position, you will study, then, not its *facts*, but its *appearance.* In studying the appearance, you will study a truth concerning a real aspect of the cube, but it will be of an entirely different nature from the truth of the facts of its form. It is the truth of its appearance to the eye. The facts of an object should be studied both by touch and by sight; the appearance of an object can be studied by sight only.

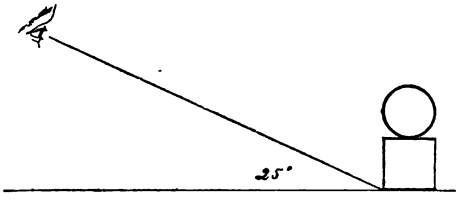
**Appearance of a Group of Models below the Eye.** — In grouping models or objects, great regard should always be paid to the pleasing or picturesque appearance of the group as a whole. In other words, they should be selected and arranged so that the general effect will be attractive whether considered as a group

of models or objects, or as represented in a picture. We speak of a **combination** of models or objects when they are to be viewed or studied with regard to the facts of form; of a **group** of models or objects, when they are to be seen or studied with regard to the *appearance* of form. A *combination* of models or objects may be made for any purpose, and does not necessarily denote any special relation between the objects; a group of models or objects should always be made with reference to its pleasing effect, and does therefore denote some special relation between the models or objects which will make their appearance together attractive.

The models grouped for this exercise are the sphere and the cube. These are models of the simplest and most regular of all the type forms, hence there is a peculiar fitness in grouping them together. In the grouping for this exercise, the sphere is placed upon the cube. By experiment it will be found that the best effect is obtained, when the sphere is placed upon the centre of the top face. Children can be led to appreciate this point. As these models are so perfectly regular, this group should be very regular.

A group of models, rather than a single model, has been chosen for this exercise, because it is easier to see the true appearance of objects when grouped than when studied separately. In studying the appearance of objects, as in all other study, the order should be from the known to the unknown. The sphere, the appearance of whose outline is always a circle, is grouped with the cube as an aid in studying the appearance of the cube.

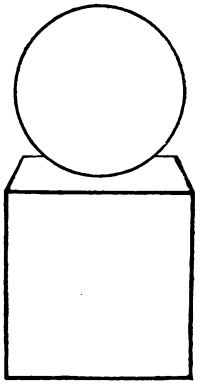
Place the cube facing and the sphere upon the centre of the top face of the cube for the study of the appearance of the group. The appearance will be the most pleasing if the group is placed so as to be at an angle of about 25° below the eye. If placed at a greater angle, the effort required to see it is greater. This effort to see will be reflected in any drawing of the group by a slight effect of constraint. Such an effect should be prevented by careful placing of the group.



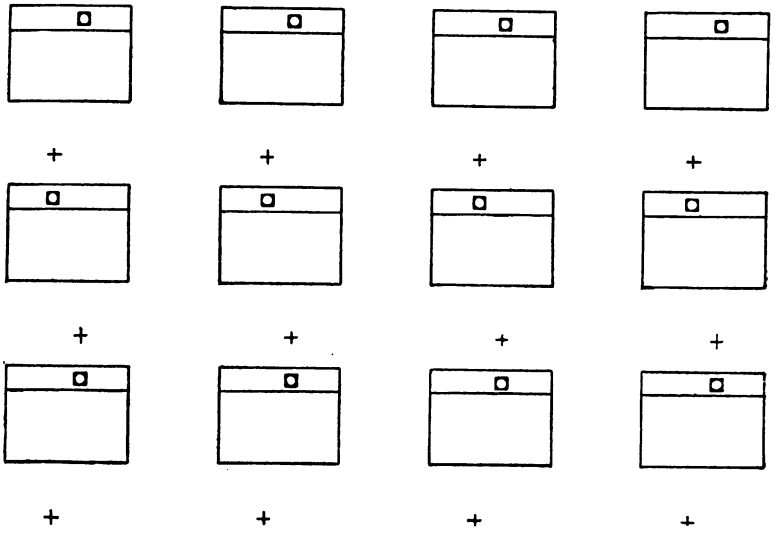

Study first the appearance of the outline of the sphere, which is a circle. Look now at the front face of the cube; this appears as a square. Look at the top face. You cannot see all of it, as part is hidden by the sphere. The part hidden is the part furthest away from you. You can see but part of the further edge of the top face. You see the left and right parts of that face, but not the middle. You see that these left and right parts appear to touch the outline of the sphere. You see that they appear to touch this outline quite low down, — not nearly so high as half-way up the outline.

Now look at the left and right edges of the top face. You see that those edges *appear* to run toward the outline of the sphere. Remember that you are now studying the appearance; you must give no thought to the facts, but be true to the appearance. If the left and right edges *appear* to run toward the outline of the sphere, you must recognize this as a *truth* of appearance.

Look now at the lowest part of the outline of the sphere. You see that it does not appear to touch the centre of the top face of the cube. It appears to touch in front of the centre. This is because you are looking slightly down upon the sphere and therefore cannot see the point where it really touches the face of the cube; you see only the point where it *appears* to touch the cube. Notice that the sphere does not look quite as wide as the front face of the cube. The illustration shows the true appearance of the group below the eye — with the outline of the sphere appearing below the centre of the top face. Now draw the appearance of the group, remembering to make the drawing of suitable size for the space and to make the left and right margins equal. The upper margin may be wider than the lower, but the lower should never be wider than the upper. Pupils must be aided in planning the space and size for this drawing.



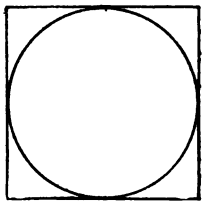
In giving this work to your pupils, do not attempt to develop with them all that has been stated. Above all, do not tell them what they ought to see. Let the pupils



sit alternately a little toward the left and the right of their respective desks, beginning by having those in front sit at the left. Let those pupils sitting at the left arrange the group on the back of the desk at the right end; let those sitting at the right arrange the group on the back of the desk at the left end. Each pupil, except those sitting in the front row, can then study and draw the group on the desk in front of his own. If possible, do not have the seats in the front row occupied. This can sometimes be accomplished by having the pupils in the front row take the seats of those who are absent. If this is not possible, let each pupil in the front row arrange a group to draw from on the desk opposite, being careful however to place the cube somewhat turned on the desk, so that the cube may face him squarely when he looks at it. A plan of the seating is given on page 24, the crosses representing pupils.

It is important that the drawing for this exercise should be the results of the pupils' own observation; therefore each pupil must study a group, and the teacher must be very careful merely to guide the seeing and not in any way to force it. Especially do not speak in any way of perspective; this is not intended as an exercise in perspective, but as an exercise in studying and drawing a group as it appears.

**Combination of Sphere on Cube — Top View.** — In case there are any teachers who, from existing school conditions, are not able to give the exercise in studying the appearance of a group, the top view of the sphere on the cube may be studied. Placing the combination directly beneath the eye, you see the top view, — the outline of the sphere just within and touching the outline of the top face of the cube. You see a circle within a square.



**Other Models.** — If the pupils have had two years' training in "The Use of Models," it will be well to take this opportunity to use some of the other type forms for groups. The sphere may be placed upon the cylinder or upon the square prism, horizontal from left to right (see page 114). In the former case, the drawing may be made the other way of the page. The ellipsoid or ovoid may be placed on the square prism, horizontal from left to right. Different groups may be assigned to different rows. The same method of study may be applied as in the case of the group of the sphere and cube.

**To be developed.** — **Group of models; facts, appearance; appearance of top face of cube, not as wide from front to back as from left to right; left and right edges appear to approach each other; placing models; placing drawings; margins; drawing.**

**Suggestions for Study of the Group by the Pupils.** — Those in the front row may sit a little at the left, those in the next row a little at the right, and so on, — every other row at the left, every other row at the right. All may arrange the models back on

the desk on the side opposite you, — those on the left arrange on the right end, those on the right arrange on the left end. Place the cube first, facing the front of the desk. Upon it place the sphere so as to look well. Those in the front seats may take the vacant seats in the room.

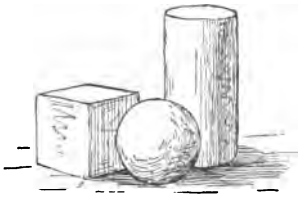
Place the cube on the front of the desk. Look directly down on it. How many faces do you see? Which face do you see? How does it look? Place the sphere on the cube. Look down on them. What would you draw for the top view of the sphere on the cube? You can each now study the group on the desk in front of your desk.

On which face of the cube does the sphere rest? Can you see all of the top face? What part of the further edge can you see? How high up behind the sphere does the further edge appear? How do the left and right edges appear? Where does the sphere seem to touch the top face? Which appears to be wider, the cube or the sphere?

**Drawing-Book, *page 9.*— Drawing the Sphere on the Cube.**

**Observation by Pupils.** — Look at the blank space on the page. There are no points given to help you in placing your drawings. Where should the drawing be placed so that the page will look well? (*The drawing should be placed in the middle of the space.*) Open your readers. Do you know what the blank spaces around the printing are called? (*The blank spaces are called margins.*) Close your readers. Do you find any margins on the page of the drawing-book? In drawing in a blank space, what margins should you leave about the drawing? (*There should be a margin at the top and bottom, at the left and right.*) How should these compare? (*Those at the left and right should be equal; those at the top and bottom may be equal, but if they are unequal, the margin at the top should be greater than that at the bottom.*)

**Directions.** — Draw either the appearance of the group, or the top view of the sphere on the cube. In either case, decide on the proportion of width to height of drawing, and plan for good margins before beginning to draw.



## EXERCISE VIII. — Apple, from the Object.

**MODELS:** ***Sphere, Apple; each Pupil brings an Apple, pleasing in form.***

**OBJECT. To study a familiar and pleasing object of spherical form; to see and to draw the outlines of an apple.**

**Beauty of Form.** — The leading thought in all work in Form Study and Drawing should be development through truth and beauty. All art has for its object the true expression of beauty.

The selection of all models or objects for this work should be governed by the interest of the child, for without that interest the work of the teacher will be hard and the results will be meagre. But the selection should also be governed, even in the most elementary stages of the work, by the thought of the beautiful, so that each lesson may have for its aim, not only a broader mental development, but also a higher spiritual development.

The objects given in the previous exercises have all been models of type forms. These appeal to the child as type forms of their playthings, of their food, of those things that administer to their pleasure, — the beautiful to the little child is that which is comfortable and agreeable. But type forms are forms of ideal beauty. Through the use of these type forms of those things that are agreeable and therefore beautiful to him, the child is led unconsciously to the ideal. Hence the models given to the child should be as perfect embodiments of these type forms as possible. Imperfect models violate the first principles of the work.

The selection of natural objects must be made with equal care. It is frequently said that "Nature never makes a mistake." The inference made by some from this statement is that all natural objects are beautiful. A moment's reflection will show that this is not true. In selecting natural objects, of any definite kind, for Form Study and Drawing, the guiding thought should be to choose a characteristic and beautiful example. For this exercise apples should be chosen which express best the general idea of an apple. Apples which are almost perfectly round can be found, but they cannot be considered as being the most beautiful examples, as they are not characteristic, and therefore not typical. The effort should be, at this time, not to find an apple that is like a sphere, but an apple that is most like an apple. Therefore try to have the apples used in this exercise, on the one hand, not too round, and, on the other hand, not unusually irregular. The apples should also have the beauty of freshness.

"There's a smile on the fruit."

A short lesson on choosing an apple should be given to the pupils on the day before this exercise. The teacher should have four apples, — one that is wider than it is high; one that is higher than it is wide; one that is as high as it is wide, and that is very round; and one that is *very* one-sided.

**Selecting an Apple for a Model.** — Can you mention any different kinds of apples? Can you tell anything about the difference in form of the different kinds? (*Some are wider than they are high; some are higher than they are wide; some are as high as they are wide, and almost like a sphere.*)

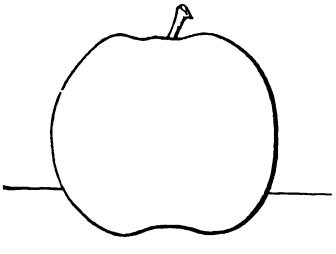
Here are three apples; look at their form. Think of the apples that you have seen and that you have eaten. Which of these three apples were the most of them like in form? (*The most of them were like the apple that is wider than it is high.*) How often do you see an apple that is just as wide as it is high, that is very round? (*I do not see an apple that is very round very often.*)

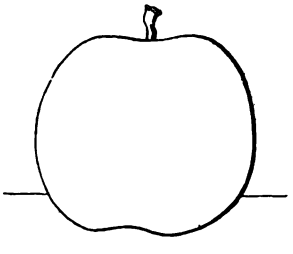
(The teacher presents the very one-sided apple with the one that is wider than it is high.) Here is another apple; which of these two do you like the better? Which would you rather have to eat?

Then, as you are each going to draw an apple, it will be well for you to try and bring one that has the form that you see the most often, — that is, one that is wider than it is high. If you cannot get such an apple, you can perhaps bring one that is higher than it is wide. Either of these will be better than one that is very round. Try also to find one that is not very one-sided, one that is fresh and firm, and that looks like a real good apple.

**The Apple.** — In the study of the front view of the hemisphere, the height was found to be half the width. It would be said, then, that the height was to the width as 1 to 2, and that the proportion of the hemisphere was as 1 to 2. It is not possible always to determine proportion so definitely. In the study of the apple, it will be sufficient to notice that it is somewhat (a little or otherwise, as the case may be) wider than high or possibly higher than wide. Appeal to the judgment here; children are more accurate observers than is many times supposed.

Study an apple thoroughly and draw the exercise before giving it to the children. Hold an apple at arm's length opposite the eyes, to get a front view. Notice whether the outline shows a depression at the top and bottom, and also whether the depression is slight or deep. Notice that the stem appears to start directly from the outline, and also that when you hold it in a different position the stem appears to incline differently. (Compare the illustrations with that on p. 32 as to the stem.)





Hold the apple to get a top view; notice that the stem starts from the depth of the depression and that the depression has no outline. Hold the apple slightly below the eye at arm's length; notice that the stem is seen in front of the outline of the apple and hides a little portion; that the stem seems to spring from the outline of the depression, which is now visible in front, but which becomes indefinite at either side.

**Blocking-in.** — The method of showing the general form or figure of an object by straight lines is known technically as blocking-in, and the straight lines used are called blocking-in lines. Blocking-in is of great use in two ways: first, as a means of *studying* a form; second, as an aid in drawing a form. The study of the apple by means of the pencil, as suggested below, is intended to lead to blocking-in. In blocking-in or in drawing irregular objects, it will not be advisable for the teacher to count for the pupils' movement and drawing, but the pupils must be trained to move for each line before drawing.

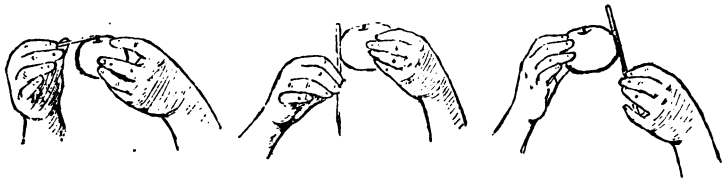
**The Spirit of the Lesson.** — Try to make every exercise a means of promoting the mental development of the pupils; incite them to observe, to discover, to express. But try also to make every exercise in some way a stepping-stone to the elevation of the spiritual nature. Lead the imagination out to beautiful pictures, to pictures of humanity. Read or repeat or write upon the board a verse of poetry. Little children will enjoy the cadence of the verse and the rhythm of the lines, while there will remain with them something of the thought, — more perhaps than we think. If you will read to the children, just before they begin to draw the apple, a verse or two from Bryant's beautiful poem, "The Planting of the Apple-Tree," you will find that something of the spirit of the poetry will be carried into the children's work; the beautiful thoughts in their beautiful form will be a refreshment and a help to you all.

**To be developed.** — **Proportion of apple; appearance of apple; beautiful thoughts; depression, outline; blocking-in the outlines.**

**Suggestions for Study of the Models by Pupils.** — Span the *sphere* from top to bottom and from left to right; are the distances the same? Span the *apple* from top to

bottom, from left to right. How do the distances compare? Hold the apple on a level with the eyes and trace the outline on the apple with the fingers, following the depression at the stem and at the blossom. From what part does the stem appear to spring? (*It appears to spring from the outline of the apple.*)

Hold the apple somewhat below the level of the eyes. Trace the outline with the fingers. Where does the stem appear to begin? Can you see the outline of the apple through the stem? Trace the *outline* of the depression in *front* of the stem.



Place a pencil on the sphere (the pencil touches at but one point). Place a pencil across the top of the apple; notice where it touches and whether it slants; observe the bottom and the sides in a similar way.

**Drawing-Book, *page 10.* — Blocking-in an Apple, from the Object.**

**Observation by the Pupils.** — Pile two or three books together on the back part of the desk, so that the top face of the upper book will be even with or above the little guard rail at the back of the desk. Place your apple on the pile of books.

Study the apple on the desk next in front of your desk. Note the further part of the outline of the apple at the top, — that part back of the stem. Does it look higher than the stem, or does it seem to cross behind the stem part way up? (The answers will vary according to the apple which they study.) Look at the outline of the apple in front of the stem.

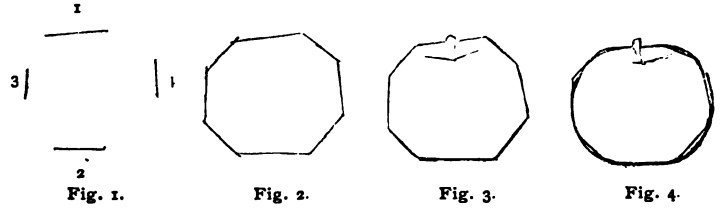



Fig. 1. Fig. 2. Fig. 3. Fig. 4.

**Directions.** — Make on the left half of the page a *full-size* drawing of the apple just studied, blocking it in, as in Figs. 1, 2. Think carefully as to placing the drawing well on the page. Draw light lines to show height, as in 1, 2, Fig. 1, then light lines to show the width, as 3, 4, greater or less than the height, as the case may be. Draw straight lines for the shoulders (see Fig. 2), slant the sides if necessary, and draw straight lines for the lower part of the sides.

On the right half of the page block in the same apple again. Draw straight lines for the stem and the depression (see Fig. 3), always drawing two lines to show the width of the stem. Draw the curves of the apple over the straight lines. (See Fig. 4.)

## EXERCISE IX.—Apple, from the Object.

MODELS: ***Sphere, Apple; each Pupil has an Apple, pleasing in form.***

**OBJECT. To study further a familiar and pleasing object of spherical form; to see and to draw the outlines of an apple; to finish the drawing.**

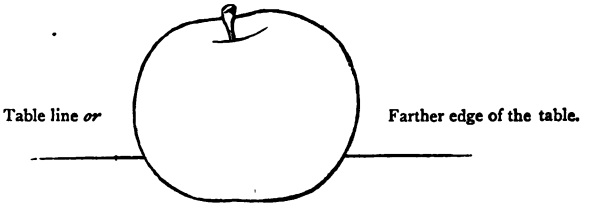
**Quality of Line.** — It is desirable in this work that the line should be, as a rule, broad, soft, and gray, instead of thin, wiry, and black. The texture of the line should be open and transparent. To secure this, the line should be made with light pressure, using rather a soft pencil having a broad or a conic face (*not* a sharp point to the lead). There will then be in the line little spaces between the particles of lead which make it, giving openness and transparency.

The wooden models are exact in form and outline; therefore in drawing their outlines, a line even in width while also soft and transparent should be used. Natural objects differ from manufactured objects in having varying outlines. The outlines not only vary in direction, but they are more decided and definite in some parts than in others. This variation in direction and in definiteness is expressive of the varying forces of life and growth, and must be rendered by a similarly varying line in the drawing. In the case of the apple, for instance, the outline should not be drawn of absolutely even width throughout, but should vary a little according to the certainty or uncertainty of the outline of your apple. The stem should be drawn with a somewhat narrower line than that used for the apple, and this also should vary in width.

**Table Line.** — In order to show that an object is resting on something, and thus to give an effect of rest to the drawing, what is called a **table line** is added. The table line represents the further edge of the face on which the object rests. Place an apple on a book slightly below the level of the eye and observe how high up on the outline the further edge of the book appears to be. This will help you in drawing the table line. In order to have the table line properly observed, the teacher must see that objects are not placed too near the further edge or too far in front of it. In the former case, the table line will appear too low and as if the object were in danger of tumbling off; in the latter case, the table line will appear too high and as if the object were placed on quite too large a face. A good general rule is to place the object so that the further edge of the face on which it rests will appear to be less than half the height of the object. In cases where the object is not as high as it is wide, this rule cannot always be applied.

In drawing the apple, proceed as in Exercise VIII., then erase such parts of the blocking-in lines as will interfere very much with the outline of the apple, but leave as much of them as possible. The straightness of the blocking-in lines will add very much to the effect of vigor and life in the drawing. Finish by drawing the outline,

varying in width of line, over the blocking-in lines. Remember that the outline cannot be seen through the stem, and that it should be erased where the stem crosses it. Be careful to make a full-size drawing yourself and to have your pupils do the same. Study and draw the table line.




**To be developed. — Proportion, curvature; character of outline, varying line; table line; thoughts of beauty; drawing the outlines.**

**Suggestions for Study of Apple by Pupils.** — (The teacher should see that none of the pupils have abnormal specimens from which to draw.) Study the proportion of your apple. Which of you find your apple wider than it is high? Which find your apple higher than it is wide? Then before drawing an apple what must you study carefully? (*We must study its proportion.*) Hold the apple in your left hand, on a level with the eye. Trace around it with the forefinger of your right hand. What are you tracing? (*I am tracing its outline.*) What is the general shape of the outline? (*The general shape of the outline is circular.*) Is it a perfect circle? In what way does yours differ from a circle? How does yours differ? If we wish to draw an apple, then, what must we study beside its proportion? (*We must study its outline.*)

**Drawing-Book, *page 11.***

**Observation by the Pupils.** — (Place books as directed in Exercises VII. and VIII). Place your apple on the pile of books.

Study the apple on the desk next in front of your desk. Note the proportion of the apple. Study the general directions of its outline, and the position and inclination of its stem. In the last exercise what did you draw first? (*We drew blocking-in lines.*) What did they show? (*They showed the proportion of the apple, and the general direction of the outline.*) What did you do next? (*We drew the curves of the outline and the stem.*)

**Directions.** — Consider the space on the page for the drawing, and the proportions of the apple you are to draw, and decide where the drawing should be placed so as to leave the proper margins. Observe your apple carefully, and make a *full-size* drawing of it, blocking it in as in Figs. 1, 2, and 3, page 30. Draw the curves of the apple lightly over the straight lines. Erase blocking-in lines, and finish with a gray line varying in width. Look at your apple and observe the object upon which it rests. Notice where the further edge of the book seems to come against the apple. Draw the table line.

## EXERCISE X. — Kite. — Proportion. — Trisection.

MODEL. *A Kite.*

**OBJECT. To study the shape and proportion of the kite; to practice trisection; to draw the outlines of the kite.**

**Free and Ready Drawing.** — In selecting exercises for this stage of pupils' work, one aim has been to obtain such forms as would give practice in drawing long, bold lines with free movement.

One great fault in much of the instruction given in drawing is that the copying of small figures, or of figures containing too many lines, is required. It will be observed, that one of the purposes apparent in all the exercises of this course is the encouragement of bold, free work. It cannot be too often repeated that the drawing should be done with free movement from the shoulder, and should always be preceded by repeated movement in the direction of the line to be drawn. To insure this, the teacher should continue to *count* for movement and drawing of all regular figures, like the circle, the square, the kite, and similar drawings, until the habit of repeated movement made freely and continuously from the shoulder before drawing, and of the same free and continuous movement while drawing, is well fixed. The teacher should then, however, seek opportunity to lead the pupils to count for movement and drawing for themselves. Drawing will be of very little value, unless that training in free movement and drawing, which will insure ready execution, is given.

**The Kite.** — The object chosen is one that will appeal directly to the interest of the child, and besides contains in itself many more lessons than might be supposed. In it we find symmetry and proportion, the axis of symmetry, trisection, construction lines, free drawing in long lines, and some opportunity for varying lines.

**Symmetry and Proportion.** — These two essentials to beauty are here presented in the most elementary form, that a foundation may be laid for their constant development throughout the work. The ability to recognize and appreciate these essentials is of the greatest value and will lead to the highest artistic culture and enjoyment. This ability never comes wholly by nature, but must be to a great degree the result of development and training.

**Symmetry** belongs to an object considered as a whole, and is produced by a balance of parts. In the simplest form of symmetry, the balance is produced by parts which are exactly alike. It will be necessary to develop and illustrate what is meant by repetition on an axis of symmetry. At this elementary stage, and in teaching children, the word "balance," with which most children are familiar, may be used to illustrate the idea of symmetry.

Refer to even balance scales, and lead the class to see that, when using such scales, the grocer finds out how much tea it takes to make a pound by *balancing* a pound weight on one side of the scales with an equal weight of tea on the other side. Balance means an equal weight on each side of a point of equilibrium.

A good way to illustrate with objects what is meant by symmetrical repetition on an axis is to hold up the two hands before the class, with the palms outward and the thumbs touching each other, and let the children do the same, and make all changes that you make. Call attention to the fact that the hands are of the same size and shape; in other words, if we imagine a vertical line between them, they would balance each other on this line. This line would be called an axis of symmetry. Now, hold the right hand still and turn the left hand around so as to present the back of it to the class, and then ask if the two hands are now alike with regard to the supposed vertical line; the children will be able to tell you that while the thumb of the right hand touches the vertical line, the little finger of the left hand touches it, and the thumb of this hand is on the further side of the hand from the vertical line; also that none of the fingers of the left hand are in the same position with regard to the vertical line as the fingers of the right hand. To make this point still clearer, fold the left hand as on an axis over the right hand, so that the palm of the left hand will be against the back of the right hand. The children will tell you that now the thumbs and fingers on the two hands do not coincide at all.

Place the hands in the first position again. Carry the left hand up so that it will be higher than the other; the children will tell that the two hands do not now balance in position; thus endeavor to lead pupils to grasp intelligently the principle that symmetry requires the balancing of forms on an axis in such a way that they shall be alike in position with regard to the axis, as well as alike in form. Axis of symmetry can also be well taught by paper-folding. An axis of symmetry is a line, real or imaginary, which divides a figure into two equal parts which correspond in form and in position with regard to the axis.

**Proportion** also belongs to an object considered as a whole. It is the relation of unequal parts to each other; thus the proportion of the kite in the drawing-book is the relation of width to height and is as 2 to 3. The teacher should have a kite for the class to study, and while it need not be of the same shape as that given, it should be of the same proportion, as the exercise is intended to emphasize that particular proportion, which is a very good one. Good proportion is produced by a pleasing inequality of parts. The parts should not be nearly equal, neither should they be extremely unequal. Moderation is one of the laws of good taste.

**Trisection.** — In order to obtain the proportion of the kite, that of 2 to 3, it will be necessary to be able to **trisect** as well as *bisect*. Trisection means division into three *equal* parts. It is necessary, therefore, in trisecting, to find some way of

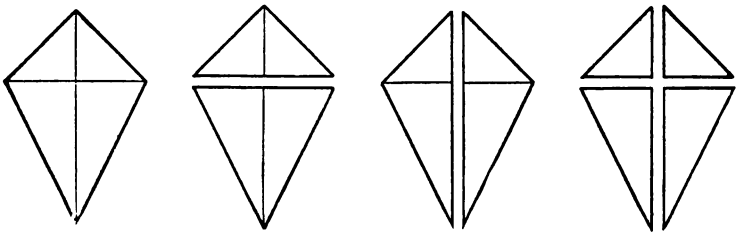
comparing the three parts with each other before the final division marks are made. Such a way is illustrated below.

**Construction Lines.** — The kite is a specially good example of the value of construction lines, which the children can readily appreciate. For as the vertical and horizontal sticks are necessary to the construction of a kite, so the vertical and horizontal lines are of great value in the drawing.

**Drawing.** — In drawing the kite, follow the directions given at the end of this lesson. Notice that there is a little opportunity for rendering varying thickness in the bobs and strings. If any pupil suggests that the tail is quite too short, tell him that frequently, in drawing, there is not room for the whole of a form; that many times only a part is given to suggest the whole. In the reading lesson, it will be possible to call the attention of pupils to this in many illustrations. The suggestion of the form carries the thought along and helps to a more complete image in the mind.

**Spirit of the Lesson.** — Do not let the lesson rest with symmetry, proportion, construction, trisection, drawing, but carry the thought of the children up into the free air with the kite as it soars. If they think of a kite that they could really fly, their thoughts will carry their pencils.

**Review.** — If the pupils have had in the first two years of school the work in "The Use of Models," the kite affords excellent examples also of right-angled and isosceles triangles, as well as of right, acute, and obtuse angles. The illustration below shows how the straight-lined kite shape can be separated into triangles. A little time might well be given to a quick review of these, using the square, right-angled, and equilateral triangular prisms, the cone, and the pyramid to recall the triangles. The forms and the names of these models should be kept familiar to the pupils. The study of details of form should be from models and objects.

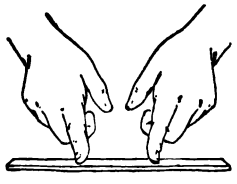


**To be developed.** — **Kite shape; construction lines; proportion 2 to 3; axis of symmetry; trisection; imagination; drawing the outlines; quality of line.**

**Suggestions for Study of the Kite by Pupils.** — Look at the kite which I have. Trace its shape in the air. What part of it is made of wood? (*The frame is*

*made of wood.*) What is the frame like? (*It is like a cross.*) Notice the horizontal piece of the frame. What could you name it? (*It might be named a cross-piece.*) (The teacher places a finger half-way between this cross-piece and the lower end of the vertical piece.) Look at the distance from the cross-piece to the top, from the cross-piece to my finger, and from my finger to the bottom. Compare these distances. What can you say about them? How many of them are there? Notice the cross-piece. How does the vertical stick divide it? Compare these parts with the part of the vertical stick above the cross-piece. How do they compare in length? How many parts of this length in the cross-piece, or the width of the kite? How many in the vertical piece, or the length? How does the width compare with the length? Then the proportion of the kite is as what two numbers? (*The proportion is as* 2 *to* 3.) How does the vertical stick divide the kite? (The teacher gives the name **axis of symmetry.**) What is the use of the tail?

**Trisection.** — Take a sheet of paper. Look at the upper edge, and think how to divide it into three equal parts, to **trisect** it. Use the fore-fingers of both hands to trisect the edge, and look at the distances carefully. Then fold the paper to get three equal parts; crease the folds and detach the parts.



Place one of the parts on the desk with the long edges from left to right, and trisect the left edge, first with the fingers, then by folding.

**Drawing-Book, *page 12.* — Drawing the Kite.**

**Observation by the Pupils.** — Look at the drawing of the kite. What is its proportion? What lines have been drawn? What would you draw first? (*I should draw the axis first.*) How would you decide where to place the cross line? What figure is the upper part of the kite like?

**Directions.** — Use the points given for the axis and draw it. Trisect it. Through the upper point of trisection draw a horizontal line, equal to two of the parts, making each half of this line equal to one third of the vertical line. Practice movement for a circle which shall pass through the ends of these lines, and draw the semicircle.

**Draw** the oblique lines from the left and right ends of the horizontal line to the lower end of the vertical. Add the point at the top and the strings for the tail. Finish the outline in broad gray lines. (These directions assume that the kite used for the model is the same as the one shown on page 12 of the Drawing-Book. Of course the drawing must show the outline of the kite studied, and should not be a copy of the printed illustration.)

## EXERCISE XI. — Angles, — Right, Acute, and Obtuse.

MODELS: ***Four-inch Square of Paper, Eight two-inch Sticks.***

**OBJECT. To study corners and angles; to represent them by stick-laying and drawing.**

**Corners.** — The cube has been studied as a whole, as to its surface, faces, and edges. A little thought should now be given to its corners. There are three kinds of corners, — **solid** corners, formed by the meeting of three or more faces (a solid corner formed by the meeting of three faces is called a **triface** corner); **biface** corners, formed by the meeting of two faces; and **face** corners, formed by the meeting of two edges. All of these kinds are found in the cube. The triface and the biface corners may be also either outside or inside corners. The cube has only outside corners. A room or a box has inside corners.

At this time face corners only will be considered. The face of the cube naturally presents itself first, as having been already studied. Any face of the cube is a square. For the purposes of convenient study, cut a square of paper. The square has four equal straight edges and four corners, formed by the meeting of the four edges. The corners are all alike. In order to find out most quickly how to describe these corners, it will be necessary to contrast them with other corners. These can readily be produced by folding.

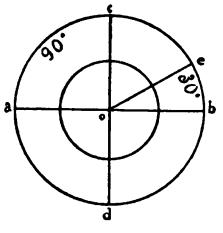
Folding is a kind of manual training. All work in manual training should be done with great care and accuracy. To insure accuracy, folding should always be done on the plane face of some object; never in the air. Lay the paper square on the desk with a corner toward you. Fold the nearest corner over to the furthest corner and crease. One corner of the square remains, but there are two different corners. Unfold the square. Turn the square to the right, so that the next corner will be toward you. Fold the nearest corner over to the furthest corner and crease. Unfold. (See Fig. 2, page 42.) Turn the paper to the right, so that an edge will be toward you. Fold the nearer edge to the further edge and crease. Fold from the corner to the middle, as shown in the illustration at the right. There are now three different kinds of corners, because the edges differ in their relative directions. The edges forming the two left corners meet squarely like the corners of a square, and the corners are therefore called **square** corners; the edges forming the upper right corner incline more toward each other and meet more sharply, and the corner is therefore called **a sharp** corner; the edges forming the lower right corner incline more away from each other and meet less sharply, and the corner is therefore called a **blunt** corner. Many corners of

each kind can be found in every schoolroom. Corners, then, may be classified as *square*, *sharp*, or *blunt*, according to the relative inclination of the edges or faces which make them. This relative inclination is measured by angles.

**Angles.** — An angle is the difference in direction of two or more faces, edges, or lines; it is therefore used as the measure of a corner. The angle made by the edges of a square corner is called a **right** angle; the angle made by the edges of a sharp corner is called an **acute** angle; and the angle made by the edges of a blunt corner is called an **obtuse** angle. In the corners of the folded square you find two right angles, one acute angle, and one obtuse angle. In every corner there is an angle, but there may be angles without corners. A corner is made by the *meeting* of two or more faces, edges or lines. As an angle means the difference in direction of edges or lines, an angle is made whether the edges or lines meet or do not meet. Angles are estimated by the number of degrees of a circle which they contain. Any whole circle has 360 degrees. A degree always means the three hundred and sixtieth part of the circle, and so designates a less or greater absolute distance, according to the size of the circle. Thus a degree of the distance around the earth is about 69⅙ miles; while a degree of the distance around an orange, or a pencil, is only the fraction of an inch.

The number 360 was fixed upon to designate the degrees into which a circle should be divided, because, being the common multiple of so many numbers, but few fractions occur when it is used in making actual calculations; thus, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, etc., will divide 360 without a remainder.

The opening of a right angle is equal to one fourth of any circle. To illustrate: From *o*, as a centre, strike two circles. Draw two straight lines, *a b* and *c d*, perpendicular to each other. The two intersecting straight lines, which form four right angles, will divide each circle into four equal parts. Thus the opening of a right angle is equal to one fourth of a circle, large or small, and equals ninety degrees, indicated thus, 90°. While the measure of a right angle is always the same, the measure of an acute or an obtuse angle varies. If we wish to give the exact measure of any angle except a right angle, it must be done in degrees. An acute angle is any angle less than 90°. The angle formed by the lines *e o* and *b o*, being one third of a right angle, is an acute angle of 30°. An obtuse angle is any angle larger than 90°, but less than 180°. The angle formed by the lines *a o* and *e o*, being equal to one right angle and two thirds of another, is an angle of 150°.




**Stick-laying.** — After studying corners and angles in the folded square and other objects, the next step is to express in some way the ideas that have been formed

of these angles. Sticks may be used here to represent edges. They are easily handled and can be readily placed in different directions to show different angles. They can also be used to show that angles are formed when edges or lines do not meet, thus emphasizing the thought that an angle is the *difference in direction* of faces, edges, and lines. Drawing lines to represent angles will follow stick-laying. It will be found while laying sticks that each kind of angle can be made in different positions. If the angles of a square placed with the edge toward you are laid, they will all point in different ways, but they will all be right angles. If the square be turned so as to have a corner toward you and the angles laid with sticks, the angles will all point differently from those before laid, but they will all be right angles. Acute and obtuse angles may also point in any direction. It is well to give pupils opportunity to lay the different angles in different positions, as they sometimes think that a right angle must always point to the right and that the other angles must always point in the direction first seen.

**To be developed. — Corner, meeting of edges or lines; square, sharp, blunt; angle, difference in direction of edges or lines; right, acute, obtuse; drawing angles; quality of line.**

**Suggestions for Study of Angles by Pupils.** — Tell me about a cube. Find something having the shape of a face of a cube. (*This square of paper has the shape of a face of a cube.*) All place your squares in front of you on the desk with a corner toward you. Fold the nearest corner over exactly to the furthest corner, hold these corners carefully with your left hand, and crease the paper in front firmly with the fingers of your right hand. Unfold. Turn the paper toward the right so that the next corner will be toward you. Fold and crease as before. Turn the paper toward the right, so that an edge will be toward you. Fold the nearer edge over exactly to the further edge and crease. Trace along the upper and lower edges; who can tell something about the long edges? (*They have the same direction.*) Trace along a long edge and a short edge; who can tell me something about these edges? (*They have different directions.*)

Now fold as I do (see illustration on page 37). Hold your paper up in the left hand. Find the upper left corner. Move the first finger of the right hand along the edges that make that corner. Trace the corner in the air. Study the lower left corner in the same way, then the upper right and the lower right.

Who can tell me something about the edges? (*One is vertical; two are horizontal; one is oblique.*) Trace the two that are horizontal; how are they alike? (*They are alike in direction.*) Who can tell something else about the edges? (*Some of them slant toward each other; some slant away from each other; and some do not slant toward each other, or away from each other.*) We will say **incline** instead of slant. How do they differ then? (*They differ in direction.*) Which of them are like the corners of a square? Such corners are called **square corners.** What could you call the corner where the edges incline toward each other? (*We could call them sharp corners.*) And those where the edges incline away from each other? (*We could call them blunt corners.*) Find square, sharp, and blunt corners in the room.

Take your sticks and lay them on the desk so as to look like the edges of the three different corners. How do the sticks differ? (*They differ in direction.*) Then you have made **angles** because they differ in direction, — an angle is just the difference in direction. You have made three angles with your sticks. Which shows how the edges of the square corner are? That is called a **right** angle, because one stick goes directly away from the other, not inclining toward it or away from it. Which shows the edges of the sharp corner? That is called an **acute** angle. Which shows the edges of the blunt corner? That is called an **obtuse** angle. Turn your sticks and make the three kinds of angles, but make them point in a different direction.

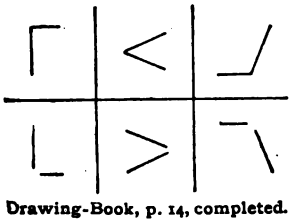
Lay two more sticks for a right angle, — one horizontal and one vertical at the left end of the horizontal. Move the horizontal a little to the right. How do they differ? (*They differ in direction just the same whether they touch each other or not.*) What do they make if they differ in direction? (*They make an angle.*) We will let the sticks lie just so and talk about corners for a few minutes. Find me a corner; another; and another. Do you find corners made with your sticks on your desk? Are there any sticks that do not make a corner? (*The last sticks that we laid do not make a corner.*) What do they make? (*They make an angle.*) Why? (*They make an angle because they differ in direction.*) How many corners have you laid with your sticks? (*We have laid three corners.*) How many angles have you laid? (*We have laid four angles.*) Can you find any right, acute, or obtuse angles in the room where the edges or lines do not meet?

**Drawing-Book, *page 14.* — Drawing Angles.**

**Observations by the Pupils.** — How is this page divided? If you desired to draw on this page two right angles, two acute angles, and two obtuse angles, how would you place them so that the page would look well? Consider the size of the spaces and how the page should look when completed. About how long should the lines be which are to form the angles?

**Drawing-Book, *page 13.* — Drill Exercise.**

**Practice.** — Straight lines with free movement. Before drawing on page 14 use page 13 for practice for free movement and direction. The exercise of page 1 is repeated here to afford practice again in long lines for the purpose of getting free movement. The directions for page 1 should be followed here. Encourage pupils to try to make the drawing on this page a great improvement on that on page 1. Try to lead them to *think* their lines while moving and drawing, and to strive for quality of line as well as for direction. The drawing practice in this exercise will be as valuable to the teacher as to the pupils.



**Drawing-Book, p. 14, completed.**

**Directions, page 14.** — Having laid sticks for the angles, draw on page 14 two right angles, two acute angles, and two obtuse angles. Draw the upper row of angles so that the lines make corners. Draw the lower row of angles so that the lines do not make corners. In placing the angles, consider the appearance of the whole page when completed. Practice movement for the direction of each line before drawing, and make the lines about two inches long.

## EXERCISE XII. — Dictation. — Folding Squares. — Diameters and Diagonals.

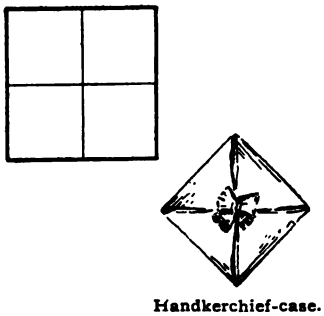
MODELS: *Two four-inch Squares of Paper.*

**OBJECT. To study the diameters and diagonals of a square; to draw squares with their diameters and diagonals; to gain practice in working from dictation.**

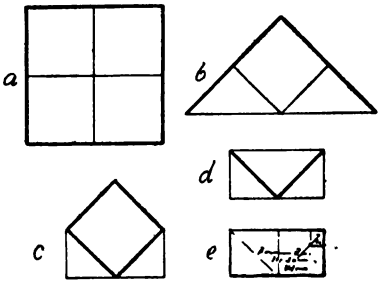
**Diameters and Diagonals.** — Having studied the square and its corners, the lines which respectively divide its surface into two equal parts — its diameters and its diagonals — are next to be considered. The **diameter** of a square is a straight line passing through the centre and parallel to two of its opposite sides, thus connecting the centres of two opposite sides. The **diagonal** of a square is a straight line connecting opposite angles. The teacher should give exercises in folding the diameters and diagonals of a paper square, so as to lead pupils to see that the diameters connect the centres of opposite sides, while the diagonals connect opposite angles or corners. Folding should always be done upon the desk.

Diameter means "a measure through." Diagonal means "between the angles." A square is said to have two diameters and two diagonals. This statement is not strictly accurate, since more than two straight lines can be drawn through the centre of the square, and be considered as "measures through." But in drawing we have frequent occasion to use the two lines which are defined as diameters. They are thus designated for the lack of some more specific and appropriate word. Both diameters and diagonals cross each other at the centre of the square.

**Busy Work.** — Folding is such an admirable kind of busy work, that an illustration is given. For other work, see "Primary Manual without Clay Modeling."



Handkerchief-case.




Envelope.

**Drawing from Dictation.** — Dictation exercises afford variety in the work, with good results. The pupils translate the spoken words of the teacher into lines.

In such an exercise the teacher must use language with the utmost precision while the pupils must give the closest attention to the spoken words, first making a mental picture of what is required, and then drawing it. To draw from dictation, pupils must know the exact force of all the terms employed. Hence a dictation exercise is, in some respects, an excellent one for review. As pupils progress, details should be omitted, and the dictation should be of figures as much as possible. As a language exercise pupils may be asked to write out little dictation lessons of their own, with correct terms.

**To be developed.** — Square; diameters, length; diagonals; description of diameters and diagonals; drawing from dictation; quality of line.

**Suggestions for Study of the Model by Pupils.** — **Folding.** — Place one square on the desk, an edge toward you; fold the nearer edge to meet the further edge Unfold. turn the square around, and fold the other two edges together. Unfold; what can you tell about the creases? (*They go from the middle of one side to the middle of the opposite side; there can be only two in a square; they are equal; they are as long as the sides of the square.*) See Fig. 1. (These are called **diameters.**)

Place the other square on the desk in front of you, a corner toward you; fold the nearer corner to meet the further corner. Unfold. Fold the other two corners together. Unfold; what can you tell about the creases? (*They go from one corner to the opposite corner; they cross in the centre; there can be only two in a square; they are equal; they are longer than the diameters.*) See Fig. 2. (These are called **diagonals.**)

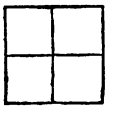


Fig 1.

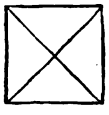


Fig. 2.

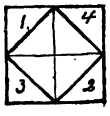



Fig. 3.

**Drawing-Book, *page 15.* — Drawing from Dictation.**

**Observation by the Pupils.** — What do you see on this page? (*I see a printed square.*) What is the position of this square? (*It is resting on its side.*) To draw the horizontal diameter of this square, where must you begin? Where to draw the vertical diameter? How should these diameters divide each other? Where must they cross? If the diagonals are drawn, where will they cross? How will they divide each other? What kind of lines would you use to represent the creases? (*We should use light lines.*)

**Directions.** — In the printed square draw lightly the diameters and diagonals, movement first. In the space at the right draw two squares, using the angles given. In the upper square draw the diagonals. In the lower square draw diameters lightly. From the upper end of the vertical diameter draw an oblique line to the left end of the horizontal diameter. Move before drawing. From the right end of the horizontal diameter draw an oblique line to the lower end of the vertical diameter. Be sure to have long pencil-holding. From the left end of the horizontal diameter draw an oblique line to the lower end of the vertical diameter. From the upper end of the vertical diameter, draw an oblique line to the right end of the horizontal diameter. (See Fig. 3.)

## EXERCISE XIII. — Decorative Design. — Study for Borders.

MODELS: *Sticks and Squares for Arrangement.*

**OBJECT. To study borders; to arrange borders and draw them.**

**Beauty in Decorative Design.** — There is in man an innate sense of beauty and a desire to express it. Being himself a conscious unit and thus having a sense of unity, he is pleased to make something which is a whole, which is complete. Thus in his work he naturally seeks to produce unity, which is the very foundation of beauty in decorative design. He has an inborn feeling for symmetry, for proportion, and for rhythm. He is himself symmetric and well-proportioned and rhythmic in his motions, and he enjoys the reproduction of these effects, so elemental in beauty, either by himself or others; for they mirror what is a part of himself. So the child is pleased if in his creative work he can produce these effects. It is easy for you, as a teacher, to build upon these natural susceptibilities, and thus to guide the pupils to a fuller and more complete sense of beauty in ornament and to develop their ability to produce it. But you must be content to let these be matters of growth. For a long time the work must be of the simplest character.

**A Border.** — A border, however simple it may be, appeals to the sense of unity, for it limits and separates from other things the object on which it is used; thus it leads to the recognition of the object, as a whole, complete in itself. It appeals also to the sense of symmetry. It will be remembered that symmetry of a whole is produced by a balance of its parts. In a simple border, the upper and lower halves balance each other. Proportion in an object as a whole, as has already been stated, is produced by the unequal relation of its parts. The contrast between the extent of a border and its width satisfies the early sense of proportion. The repetition in a border appeals by its regular succession to the sense of rhythm. For as in music rhythm is produced by a regulated succession of sounds, so in ornament rhythm is produced by a regulated succession of forms or figures.

**Unity.** — In giving this exercise in arranging borders, suggest to the pupils that they can lay a row of angles with their sticks. When a row has been laid, ask how the *row* looks, thus leading to a thought of the border as a whole. Ask if it looks as if it belonged together. Thus the sense of unity will grow. Lines of sticks for marginal lines, one above and one below the row, will increase the effect of unity, and very likely some pupil will add them without being told. The effect of unity will also be greater if the angles are joined than if they are separated.

**Repose.** — In all ornament there should also be repose. This is one of the highest principles in design, but it should be sought even in the most simple work,

and the pupil should be led to strive for it always. In early work, the question, "Is it restful?" should be frequently asked, and gradually the pupils will learn what is meant by repose in a design. By judicious comparison of quiet and vivid borders, you can lead them to discover that a design should not be staring or startling, as these qualities would prevent it from being restful.

**Figures as Units.** — If design with lines or angles is long continued, it is apt to degenerate into a mere confusion of lines. Therefore it is well to give pupils tablets — whole figures — to repeat in making borders. The tablets used for this exercise may be circles or squares. These may be used separately or together. The squares may rest on a side or they may be placed obliquely. Figures should not touch each other by points only, as that gives an effect of weakness, and therefore of unrest. They should not be so placed that the space between them will equal the width of the figure, as that would be monotonous, and therefore fatiguing, not restful. The skilful teacher can lead the children to discover all of these things.

Illustrations of borders are given on page 45 as suggestions to teachers.

**To be developed. — Borders; repetition in a straight line; repeats; marginal lines; drawing borders; quality of line.**

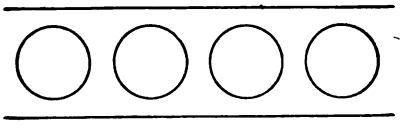
**Suggestions. Study of Borders by Pupils.** — (The teacher shows borders, — on wall-paper, on books, on aprons; the pupils find other borders.) Why do we have borders? What figures do you find in the borders? Do you find figures repeated? Do you find any borders that have not figures repeated? Borders are usually made by the repetition of figures, called **repetition in a straight line.** The figures repeated are called **repeats** or **units** of design.

**Drawing-Book, *page 16.* — Drawing Borders.**

**Observation Exercises for Pupils.** — What kind of angles do you find on page 16? (*Figs.* 1 *and* 2 *are right angles; Fig.* 3 *is an acute angle; Fig.* 4 *is an obtuse angle.*) What kinds of figures? (*Fig.* 5 *is a square on its side; Fig.* 6 *is a square on its corner.*)

**Laying Borders.** — Lay with sticks (two and three inches long) borders of right, acute, or obtuse angles. What is necessary to complete these borders? (*Marginal lines are necessary.*) Use sticks for marginal lines.

**Directions.** — In the lower space draw the border of squares just laid. Draw two of the borders just laid with sticks on page 16, connecting the points given. Arrange tablets or square pieces of paper for another border, placing the squares either on the sides or on the corners. *No erasing.*



## EXERCISE XIV. — Decorative Design. — Borders.

MODELS: *Sticks, Circles and Squares for Arrangement.*

**OBJECT. To continue the study of borders; to arrange borders and to draw them.**

**A Step Further.** — In the preceding exercises, the interest of the pupils has been awakened; they should now be led to study and improve upon their arrangements. For this purpose, the teacher should draw upon the board some of the borders drawn by the pupils in the previous exercise and should lead them to discover the best arrangements and to tell why these arrangements are good. Then they can try again to make arrangements with sticks and with tablets for new borders.

It will be interesting to the teacher to note to what extent the pupils, either in this or the preceding exercise, make the arrangements illustrated here.

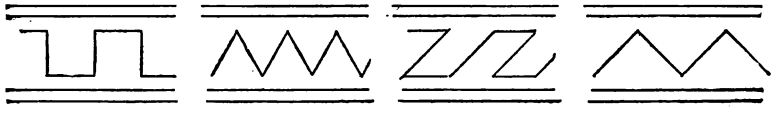


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

These illustrations show results which were produced by ancient nations in their early ornament and which have been often repeated since. Fig. 1, made by the repetition of right angles, is a simple and early example of the Greek fret; Figs. 2 and 3, made by the repetition of acute angles, recall the Egyptian and Norman zigzag borders; Fig. 4, made by the repetition of acute and obtuse angles, is called a raking fret. All of these, together with Figs. 5, 6, and 7, are found in historic ornament. If pupils can have paints to use, they can color their borders, instead of making them of colored paper.

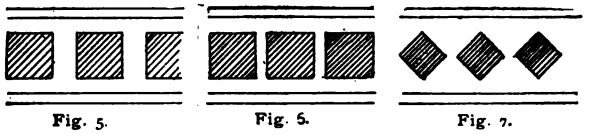


Fig. 5. Fig. 6. Fig. 7.

**Color Combinations. — Practical Points in School Work.** — This exercise so often leads to other work in colored paper, that a few suggestions in regard to combinations may be acceptable. The subject of Decoration calls especially for a knowledge of harmony of color. The study of Decoration begins in the primary schools with the attempt to make pleasing arrangements with solids, tablets,

and colored paper. As soon as the element of color enters, training in the harmony of color should begin. The training at this early stage should be rather negative than positive; statements as to harmony of the different primaries, secondaries, and tertiaries are not necessary. But inharmonious combinations should be made impossible by the observance of the following rules by the teacher: —

In choosing colored papers for use in the schoolroom, be careful first to get *standard* colors; if you can, add to these tints and shades of the various colors, so that scales of colors can be made.

At first, call for arrangements in standard colors, only one color to be used in any one arrangement; then for arrangements in tints, only one tint to be used in any one arrangement; then for arrangements in shades, only one shade to be used in any one arrangement.

Later, when combinations are made, let them be —

(1) { Of two tints of the same color. / Of two shades " " " (2) { Of a standard with a neutral gray. / Of a tint or shade " " "

Do not call for nor allow any combinations of (1) standard primaries, (2) of secondaries, (3) of primaries and secondaries.

If an object is represented by colored papers, do not allow any colors or combination of colors that would not be pleasing and suitable in the object.

If these rules are followed, the children will receive an unconscious training in the harmony of color; discords of color will seem glaring to them. In imitation, they will carry out harmony in their work with the brush.

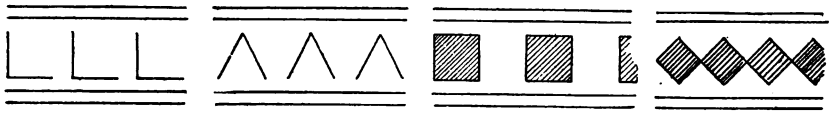


Fig. 8. Fig. 9. Fig. 10. Fig. 11.

**To be developed.** — Arrangement; repose; unity; variety; use of color; drawing and making borders; quality of line.

**Study of Borders by Pupils.** — I will draw on the board some of the borders that you made in the last lesson. What do you think of this one, Fig. 8? (*There is more at the bottom than there is at the top; it is one-sided; it does not look even.*) Is it restful? (*No, it is not restful, for the angles could not stand alone, they would tip over.*) Come and show me how you would change it; draw another on the board. (Perhaps the pupil will draw Fig. 1, page 45.) Why is that better? (*It seems more even; the border would balance now, and the angles help each other to stand, so it is more restful.*)

What do you think of Fig. 9? (*Those angles could stand; they balance, but they do not look whole; it would look better to run right along.*) Come and draw a better one. (The pupil probably will draw Fig. 2, page 45.) Why is that better? (*It is more even, and it looks more like one thing; before it looked like pieces.*)

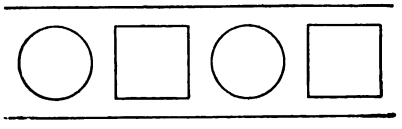
What do you think of Fig. 10? (*That looks well, except that you get tired seeing the spaces and the squares of just the same width.*) What do you think of Fig. 11, made with squares? (*It looks as if it were made of angles; if those are squares, they do not look as if they would hold together by those little points.*) Is it restful? (*It is not restful, because it looks as though it would break apart.*) Come and draw a better one. (The pupil perhaps will draw Fig. 7, page 45.) Why is this better? (*You can see each square by itself, as one square; you do not have to try to find each square.*) Try again now at your seats to lay borders. You may use sticks, circles, and squares if you wish.

**Drawing-Book, *page 17.*— Drawing and Making Borders.**

What is there at the top of the page? Read the first printed line. Tell me what you are to do. When printed matter accompanies illustrations, it is called **text.** (The teacher should examine the borders laid with sticks by the pupils and decide which border should be drawn, and should not allow pupils to draw poor arrangements for the sake of gaining variety.)

Read the text at the bottom of the page. For this border, use the squares of colored paper cut in the previous lesson. See that they are of the proper size. Remember that whether the square rests on its side or is placed obliquely, it must not be higher from top to bottom than the space between the points. If the squares are not of the correct size, make them so. Paste them in position. Just a touch of paste on the back will be sufficient to hold them in place. They should on no account be pasted all over the back, as they are apt to draw and wrinkle, and the paste is likely to appear beyond the sides. Narrow strips of colored paper as marginal lines will add much to the appearance of the border, but they need much care in pasting.

**Directions.**— In the upper space draw one of the borders just laid with sticks. Paste the lower border very carefully.



## EXERCISE XV. — Quatrefoil. — Repetition about a Centre.

MODELS: *Square, four Semicircles.*

**OBJECT. To study the shape of the quatrefoil; to see and to draw its outline in a square.**

**The Quatrefoil.** — This is an example of historic ornament found noticeably in the Byzantine and Gothic styles, although as a simple figure it occurs occasionally in earlier and even in primitive ornament. It appeared prominently in architecture and in decoration early in the Christian centuries. The people loved to make and to have before them in their churches things that would remind them of the religion that was so sacred to them. Therefore they put into their churches symbolic figures, — figures which by their color, their shape, or the number embodied, would recall to them some part of their religion. Their decoration was full of symbols. All four-leaved figures stood to them as emblems of the four evangelists, Matthew, Mark, Luke, and John. The semicircle in the quatrefoil, as well as in the kindred trefoil, represents the *nimbus* or glory of the head; so that the quatrefoil is doubly symbolic. Wherever it appeared, not only in flat decoration but also in window tracery and in other wood and stone work, it was a symbolic figure.

**Its Beauty.** — So, many hundred years ago, people were drawing this figure. Its pleasing shape has made it a favorite, even where its symbolism is not remembered. There is a pleasure in looking at a square because of its symmetry and its regularity. For the same reason, those figures known as square figures — that is, having a general square shape and the four sides the same in shape and in position with regard to the centre — give pleasure. The symmetry of such figures becomes more apparent in proportion to the variation of these four sides as to outline from the straightness of the sides of the square. This kind of symmetry is produced by what is called **repetition about a centre**; the parts are all placed with reference to the centre. The quatrefoil is an example of such arrangement.

Froebel calls symmetry the law of opposites. In symmetry like that of the kite, Exercise X., there are two opposites, the left and the right side; but in square figures there are two pairs of opposites, and in most of these figures the pairs are the same. The quatrefoil has its pairs the same. The pleasing contrast between the curves of the semicircles and the angles formed by their meeting, and still further between the direction of the curves outward from the centre and the direction in which the angles point toward the centre, adds still another element to its beauty.

**Aids in Study.** — It is very desirable that the children should be led to realize, in every way possible, that their work in Form Study and Drawing bears on everything

around them. It is well, therefore, to encourage them to make collections of examples illustrating the various exercises in arrangement and decoration. Collections of borders may be made; also of pictures illustrating borders, quatrefoils, etc. The work of placing and mounting these pictures neatly affords good practice in manual training.

**Drill.** — A drill exercise is given on circles on Drawing-Book, page 18, as a preparation for the semicircles in the quatrefoil. If it is preferred the page can be bisected and a quatrefoil can be drawn in each half, but this also should be a drill exercise. None of the drill exercises given should occupy ten minutes, as the purpose is to promote free movement and ready execution.

**To be developed. — Quatrefoil; close repetition about a centre; beauty; finding quatrefoils; move for a circle to draw a semicircle; drawing a quatrefoil; quality of line.**

**Suggestions for Study of the Figure by the Pupils.** — Open your books at page 19. What do you see in Fig. 1? (*I see a square on its side, and in it a figure having the outline of four semicircles.*) This figure is called a **quatrefoil**, meaning *four-leaved.* What do you see in Fig. 2? in Fig. 3? What is Fig. 5? (*Fig. 5 is a quatrefoil in a square.*) How should you think it was made? (*I think it was made by drawing a square and drawing a semicircle on each side.*) Where is the square? (*The square is in the centre.*) And where are the semicircles? (*The semicircles are around the square in the centre.*)

Look at the lower border on page 17; how are squares placed to make the borders? (*They are placed in a straight line, one after the other, not touching.*) How are the semicircles placed in the quatrefoil? (*They are placed around the middle square, and touching it all along the sides.*) This arrangement of figures is called **close repetition about a centre.** What is a semicircle? How does its altitude (its height) compare with its base?

**Drawing-Book, *page 19.* — Drawing the outline of a Quatrefoil in a Square.**

**Observation Exercises for Pupils.** — What can you tell about Figs. 1, 2, and 3? Look for a quatrefoil in the schoolroom, — on the wall-paper, in the platform carpet; in

iron-work, as stove, registers, desk-standards, etc.; on dresses, aprons, neck-ties, etc.; try to remember any quatrefoil that you may have seen in decoration, or in buildings.

Out of school, try to find a picture having a quatrefoil in it, — in a newspaper. Bring the paper to school, and show the picture.

**Drawing-Book, *page 18.* — Drill Exercise.**

**Practice.** — Use this page for a drill exercise before drawing on page 19. Divide the page into six parts by drawing lines from *a*, *b*, *c*. Practice movement before drawing each line. Count as suggested on page 2. In each space draw a circle with one sweep. (See page 3.) Pay special attention to pencil-holding and free-arm movement.

Or, bisect the page by a vertical. Draw in the middle of the left half a square of two inches side, first the verticals, then the horizontals. Draw a semicircle on each side of the square, moving for the whole circle and drawing the half circle. Draw by opposites. Repeat on the right half of the page.

**Directions, page 19.** — Points are given for the diameters of a square. Draw the diameters and the square lightly. Draw the inner square lightly. Draw the semicircles freely and lightly, moving in each case for a whole circle before drawing the semicircle. Erase the diameters and the inner square and finish the outer square and quatrefoil with broad, soft gray lines.

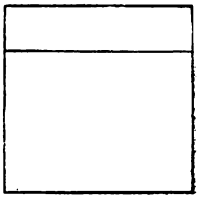
**Cutting a Quatrefoil.** — Cut a square from blue paper. If the primary colors have been studied, the paper may be green. Draw the diameters. Mark the points for the inner square. Cut the semicircles freely without drawing.

## EXERCISE XVI. — Box made by the Pupil. — Drawing the Outline of its Front or its Side View.

MODEL: ***Box made by the Pupil.***

**OBJECT. To study an object based on a cube; to see and to draw the outlines of one face.**

**Making.** — The advantages of making an object, considered both as a means of development and as an aid in gaining a knowledge of Form, are very great. When a thought has been received, the next stage in development is to express it. Making furnishes a means of expressing form ideas that have been gained through observation and thought. It shows, also, that an idea has been gained. A box could not be made, if the idea of a box had not first been received. Moreover, while the fingers are cutting and folding and pasting, the mind is receiving, through both touch and sight, renewed impressions of the form and its details and its various aspects, that are constantly growing more definite while the object is being made. The teacher should make the box from the pattern in order to gain a complete concept of the form required and also to learn the difficulties encountered by the pupil.

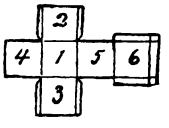


**Drawing.** — Figs. 1 and 2 on the drawing-book page are not intended as copies; their purpose is to show the box in different aspects. Only the front view as here illustrated is desired.

**To be developed. — Box, form; pattern, making; proportion of height of cover to height of box; making and drawing; quality of line.**

**Prang's Pattern Sheet, No. 2. — Making the Model.**

Cut out the pattern printed, cutting along each dark line; fold along each light line.




Paste the laps of 2 (see Fig. 2) on the *inside* of 4 and 5; paste the laps of 3 on the *inside* of 4 and 5; fold the cover 6 at the front corners, lapping within and paste, to make the cover. What is the form of the box? (*The box is like a cube, cubic.*) What is the shape of its faces? (*Its faces are square.*) What is the height of the cover compared with the height of the box?

**Drawing-Book, *page 20.* — Drawing the front view of the Box.**

**Observation by the Pupils.** — What do the pictures represent? (*Fig. 1 represents a box open, placed so that you can see into it, the corner toward you; Fig. 2 represents a box shut, placed so that you can see the top of it, the corner toward you.*) Place your box to look as in Fig. 1; as in Fig. 2. Hold it for the front view; what would you draw first? (*I should draw a square.*) What next? (*I should bisect the left edge, bisect the upper half for the height of the cover, then draw a horizontal for the lower edge of the cover.*)

**Drawing.** — Draw either the *front view* or the *side view* of the box which you have made, making your drawing twice as high and twice as wide as the box. Finish in broad gray lines.

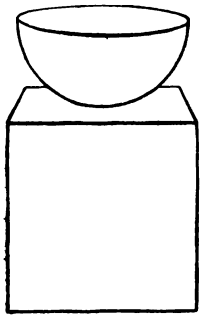
## EXERCISE XVII. — Hemisphere on Cube. — Continued Study.

MODELS: *Sphere, Cube, Hemisphere.*

**OBJECT. To study a group of two models as to its appearance below the eye and also as to its top view; to draw either the appearance or the view.**

**Review.** — As it is some time since the models have been studied, the sphere, cube, and hemisphere should be again put in the hands of the children. What they have already learned concerning these models should be brought out as a review. They have studied the sphere, cube, and hemisphere as to their facts, and they have also studied the sphere and cube as to their appearance below the eye; the study of the hemisphere as to its appearance naturally follows.

**Appearance of the Hemisphere below the Eye.** — Invert the hemisphere. Its front view is a semicircle; its top view is a circle. Raise it to the level of the eye. Lower it gradually until it is at an angle of about 25° below the eye. Watch the changing appearance of the top face. In the front view you could not see the top face; you could only see its edge as the diameter of the semicircle. As the hemisphere is lowered, the top *face* comes in sight and appears like an ellipse, or as the children sometimes say, "like a circle squeezed together." This shape becomes still more apparent if you compare it with the outline of the lower part of the hemisphere, which is that of a semicircle. You see also that the hemisphere does not appear quite as wide as the front face of the cube, as the widest part of the hemisphere is a little further from you than the cube; also that the hemisphere appears to touch the top face of the cube a little in front of the centre.



**The Group.** — After the appearance of the hemisphere has been observed, draw the group. While drawing the group, its appearance will grow more distinct to the eye. In giving the work to the pupils, be very careful not to tell them what they ought to see; have them tell *you* what they see and draw what they see. It will not be hard for them to see the appearance if they are left free. For directions for placing the models see page 15. Great care should be taken not to have the models too near the pupils, or too far below the eye. Lead the pupils to conclude from various experiments that things appear smaller as they are carried away from the eye.

**Top View.** — In studying the top view, you will find it to be the same as that of the sphere on the cube, — a circle within and touching a square at four points, see page 25. The top view alone, therefore, of either of these combinations would not be sufficient to tell what the combination was.

**To be developed.** — Appearance of group below the eye; top faces do not appear as wide from back to front as from left to right; left and right edges of top face of cube appear to approach each other; drawing the appearance; quality of line.

**Suggestions for Study of Models by Pupils.** — Hold the cube at arm's length and on a level with the eye. Hold it with one face toward you. What do you see? What view of the cube is it? Hold the cube close to the waist in front and look down upon it. What view are you observing now? What would you draw for the top view? Place the inverted hemisphere upon the cube. Hold these on a level with the eye. What would you draw for the front view? Hold them at the waist. What do you see now? What view is it? What would you draw for the top view?

**Study of the Group by Pupils as to its Appearance.** — Place the models (the inverted hemisphere on the cube) on your desks. Look at the group on the desk in front of yours. How many faces of the cube can you see? Do you see all of the top face? How many faces of the hemisphere are visible? Do you see all of the rounding face? How does the top face appear? How does its *apparent* width from front to back compare with the width of the top face of the cube? How does the *apparent* width from left to right compare with the width of the cube? Recall the top view that you have just observed. How does the actual width compare? Why does it appear to be less? Look out of the window; how does a man away down the street look compared with one near by? How does a house that is far away look compared with one that is near? How does anything far away appear? (*Anything far away appears smaller than it does when it is near.*)

**Drawing-Book, *page 21.* Drawing the Hemisphere on the Cube.**

**Observation by the Pupils.** — When about to make a drawing what must you consider? (*We must consider what we are going to draw, and the size of paper or space upon which we are to draw.*) What is necessary that a drawing may look well on the page? (See page 26.) In drawing the hemisphere on the cube as they appear to you, what will you draw first? (*I will draw a square for the front face of the cube.*) What will you do then? What will you draw for the top face? What will you draw for the hemisphere? Where does the hemisphere touch the cube? Where does it appear to touch the cube?

**Directions.** — Decide upon the proportions of the whole drawing, and where it should be placed in the space at the right. Draw the appearance of the group.

Should the teacher prefer to have the top view of the models drawn, it will be well to consider in the same way the space to be filled, and the size of the drawing to be made. Then draw a square as large as the space will allow, and within it a circle of equal diameter. Remember to allow for ample margins. Pay attention to pencil-holding, and practice free movement before drawing each line.

## EXERCISE XVIII. — Leaf from Nature.

**MODEL:** ***Plantain Leaf about the size of the copy, brought by each Child.***

**OBJECT. To study a natural leaf; to see and to draw its outline.**

**The Study of Nature.** — There is no need of a plea for the study of Nature. It appeals to all, for man feels that he himself is a part of Nature, and that in seeking Nature, which possesses a thousand responsive voices, he seeks something in a degree akin to himself, — a manifestation of the divine spirit of creation. So by subtile cords of likeness and of kinship, Nature draws us to herself.

> "To him who in the love of nature, holds
> Communion with her visible forms, she speaks
> A various language."

In Nature are found wisdom and order, symmetry, proportion, and rhythm, life, growth, and action. She opens a vast storehouse, inviting us through the gentle but strong persuasions of enjoyment and of beauty to come and learn of her. A child turns at once to Nature. Of all natural forms, animals seem the first to appeal to the child. The life and action, which correspond to his own, give him great delight. Next seems to come fruit, for that is good to the taste, grateful to the touch, and pleasant to the eye, appealing thus to three of those prime ministers to the child, — the senses.

Later come flowers and leaves, the flowers pleasing through their vivid color; the restfulness of the color of the leaves, their lightness of form, and their attractive shape, he is slower in recognizing. After a time he becomes dimly conscious of their beauty, and it needs only a guiding hand to make this beauty real to him, through the study of Nature. But there are two ways of studying a natural form. On the one hand, it may be studied for its structure, its mode of life, — in short, for all its wonderful facts or details, each fact being developed by itself with minute care; this is scientific study. On the other hand, it may be studied for what it suggests of beauty. For this purpose it should first be studied as a whole, all details being subordinate; this is art study. In the former, careful study is made of component parts, to learn what the form is made of and how it is built up. In the latter, the beautiful form is studied as an outward manifestation of the life and growth and spirit within.

**Study of the Leaf.** — The purpose of this exercise is to lead the pupils to the art study of Nature. A very simple leaf has been chosen, easy to obtain and that will bear handling, of the simplest shape and with very few details. It is not the intention at all to give botanic study here, although such an exercise might serve as a first step in that study. It is intended to be a simple art study of a leaf, through which the child will apply that primal art principle, Learn first to see the form as a

whole. The teacher, therefore, should pay little attention to details in studying the leaf. If the details are not emphasized in the study, they naturally will not appear in the drawing which is the expression of that study. Examine the leaf by passing the fingers around the margin and along the midrib. Then place it at some distance and so that you will get a front view. What you want to get is the impression given by the leaf as a whole. Look at the general shape and try to express it by blocking-in lines, first the midrib in not more than two lines; then the outline in not more than six lines. Notice the general proportion of the leaf and that the broadest part is in the centre.

Draw now the curves of the outline over the blocking-in lines, erasing those parts that are not necessary. The margin of the leaf appears to you not well defined in some places; that is because the leaf is soft and yielding in texture and so does not make a distinct outline in every part. If you make your line similarly undefined, — that is, where you see it so in the leaf, — sometimes even leaving the line broken, you will thus express something of the texture of the leaf and will be taking a step toward what is called **artistic rendering**. Notice that the outline of the leaf passes into the outline of the stem with a very gradual curve. Draw the veins in the same way that you did the outline. They are not as distinct as the shape of the leaf, and they taper; sometimes they seem to disappear and further along to appear. Try to express these things in your drawing.

Ask each pupil, the day before the lesson, to bring a plantain leaf. Be provided yourself with a quantity to supply deficiencies. In giving this lesson to the pupils, try to lead them to see the nature of the leaf. Cut a plantain leaf from green paper and mark veins upon it strongly in ink. Lead the children to tell you the difference between the paper leaf and the real leaf.

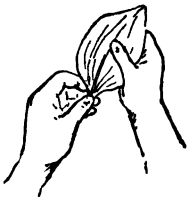
**Study of Leaves.** — This lesson may lead to other lessons on the shape of leaves.* All the technical terms necessary for this study are **margin, base, apex.** The blade of a leaf is the flattened green part. The margin of a leaf is the edge of the blade. The base of the leaf is the end near the leaf-stalk. The apex of the leaf is the end opposite the leaf-stalk. Leaves may be broadly divided into three classes: 1. Those that are broadest in the middle. 2. Those that are broadest at the base. 3. Those that are broadest at the apex.

At this stage, only leaves with *entire* margins (unbroken by notches or teeth) should be chosen. The notched leaf is more difficult to draw with proper feeling. Again, it must be said that the purpose here is not botanical study, but the art study of Nature and an art expression of that study.

* The card packages, "Shapes of Leaves," I. and II., Prang's Natural History Series, will be an aid to the teacher here.

**To be developed. — Leaf; midrib; margin; apex; character of natural leaf; beauty; drawing a leaf; artistic rendering.**

**Suggestions for Study by Pupils.** — Pass your thumb and fingers along the stem of your leaf and out to the point; what do you feel? Turn the leaf over; what do you see running out to the point or **apex** of the leaf? (*I see ridges or ribs.*) How do these ridges compare with each other? (*One seems larger than the others.*) How does this larger rib extend? (*It extends through the middle of the leaf.*) What is it called? (*It is called a midrib.*) Lay the leaf upon the desk. Beginning at the *apex* of the leaf with each forefinger, trace around the edge or **margin** of the leaf and down the stem; trace again with long *straight* lines. Trace the midrib in the same way. How does it look near the apex of the leaf? How far down the stem does it go? Are the ribs the same width throughout?



Look at the two leaves that I have. What is the difference? (*One is a real leaf, the other is just made of paper.*) What makes you think so? (*Because the paper has a stiff edge, and the real leaf is soft and wavy.*) Why do you think the leaf is soft? We feel of a thing to know whether it is soft, and you are too far away to feel of this leaf. (*I can see the edge of the paper leaf all the way around; and there are some places on the edge of the real leaf that I cannot see.*) What do you think is the reason of that? (*Because the leaf is soft, some parts roll away a little just out of sight.*) Look at the ribs of each leaf. (*It is just the same with them; in the paper leaf, I can see the whole line; in the real leaf, I cannot see every part of each rib.*) What do you think is the reason of that? (*The leaf is soft, and the ribs seem to sink in sometimes.*) Which leaf is the more beautiful? Why? When you draw your leaf, try to make it look like a real leaf and not like a paper leaf. If you cannot see the margin or the ribs in places, do not draw them.

**Drawing-Book, *page 22.* — Drawing the outline of a Leaf.**

**Observation Exercise by Pupils.** — Open your drawing-books. What does Fig. 2 show? (*Fig. 2 shows the blocking-in of a leaf.*) What does Fig. 3 show? What does Fig. 1 show? How is the margin drawn in Fig. 1? (*The margin is drawn lighter in some places than in others, and it curves in and out.*) If you wished to draw the leaf we have just studied, what should you draw first? While drawing the leaf, sit up straight, so as to look at it at as great a distance as possible.

**Directions.** — Place your leaf on the left half of the page. In the space at the left, draw the midrib in straight lines, making it as long as the midrib of the leaf. Draw each side with three straight lines. Draw the curves *over* the straight lines, getting the curve by movement. Draw two or three of the most prominent ribs.

Erase blocking-in where intrusive and finish with soft gray lines, varying them in lightness, and breaking them where you cannot see the outline and ribs plainly. Be sure to make the drawing from the natural leaf. Do not copy the illustration.

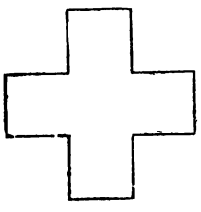
## EXERCISE XIX. — Greek Cross. — Trisection.

**MODELS:** ***Cross cut from colored paper; Square having the same dimensions as the Cross, cut from manila paper.***

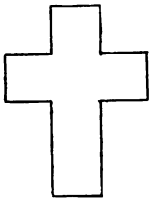
**OBJECT. To learn the shape of the Greek cross; to see and to draw its outline.**

**The Cross.** — Crosses are found to have been one of the earliest forms used in decoration. Among the early Aryan nations the cross was worshipped and the sacred symbol was placed upon their walls and pottery. It was one of the mystic symbols of Buddhism, and was used freely in decorating vases, etc. It is found frequently also in Egyptian inscriptions, where it is supposed to have symbolized future life. It was also sometimes called the key of the Nile. In Persia, as early as 850 B. C., a cross similar to the Greek cross was worn by the king as an act of worship to his God; and the cross and crescent were combined on Oriental standards many centuries before the Christian era. When the Spaniards entered Central America they found true crosses in the temples of the natives. This precolumbian American cross seems to have been a symbol of the winds and to have represented the four principal directions from which the rain comes, and thus became the symbol of the god who dispensed the heavenly waters, and by extension from this, the symbol of a white and bearded hero.

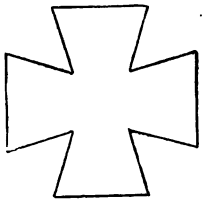
In the time of Abraham the cross was used as an instrument of capital punishment; and as a gibbet was known to the Persians, Egyptians, Africans, and Macedonians. After being put to this use upon Calvary it became the symbol of the Christian religion, and since then has been very widely used in decoration and in architecture.



Greek Cross.



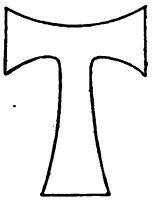
Latin Cross.



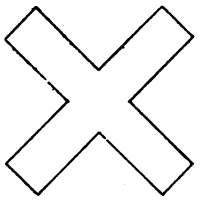
Maltese Cross.

The Greek, the Latin, and the Maltese crosses are among the principal forms of the cross. The St. Anthony's, or the Egyptian, and the St. Andrew's are also well known. The St. Andrew's cross is the one used on the British flag. It is also much used in heraldry, as are crosses of every kind.

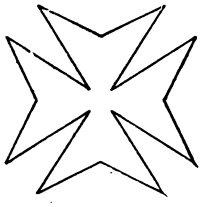
The shape of the Latin cross furnishes the ground plan for many noted Gothic cathedrals and churches, while that of the Greek cross is used in Russian and other Eastern churches. The mosque of St. Sophia is built on the plan of a Greek cross. The cross occupies so prominent a place in the decoration of all ages that it may be considered one of the most important examples of symbolic historic ornament.



St. Anthony's.



St. Andrew's.



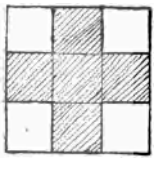
Eight-pointed Maltese.

The teacher should question the pupils as to where they have seen crosses and as to the kinds they have seen, and allow different pupils to draw upon the board examples of the various crosses mentioned. The Greek, Maltese, and St. Andrew's crosses are examples of what are called square figures, as being generally square, their four sides being alike.

This figure may be given to pupils to study and draw by themselves if they have had the primary training. This will lead to independent work. If they have not had previous training, the suggestions below will be of use.

**To be developed. — Cross, Greek, Latin; general shape, square, oblong; drawing the cross; quality of line.**

**Study of the Paper Cross.** — What is the model? (*The model is a cross.*) Can you draw at the board a different cross, and tell how it differs? (*The first is alike on all four sides; the second is like the first at the top, at the left, and at the right, but it is longer at the bottom.*) What can you say of the arms of the first cross? (*They are all equal.*) What is the name of this cross? (*It is a Greek cross.*) What is the second cross? (*It is a Latin cross.*) What can you say about its arms? (*It has the three upper arms equal, and the fourth, the shaft, longer than the other three.*)



Compare the width of this Greek cross with its height; how do they compare? (*They are equal.*) Can you mention any figures that are just as wide as they are high? (*The circle, the square, and the quatrefoil are as wide as they are high.*) Which will help you to draw the outline of the Greek cross? (*The square will help us.*)

I will place the cross on this square of manila paper. How could the Greek cross be made with square tablets or paper squares? (*The cross could be made by placing four squares around another square in the centre.*) What kind of repetition would that be

called? (*That would be called repetition around a centre.*) Look at the sides of the manila square; how are they divided now? *The sides of the square are divided into three equal parts — trisected.*) How do you trisect a line or an edge?

**Drawing-Book, *page 23.* — Drawing the outline of the Cross.**

**Observation Exercise for Pupils.** — What can you tell about Fig. 1? What is Fig. 2? What is Fig. 3? Why do you think they are on the Drawing-Book page? Can you find the figure of a Greek cross in the schoolroom?

Try to remember any Greek or Latin cross that you may have seen elsewhere.*

**Drawing.** — Two corners of a square are printed. Draw the square. Trisect the upper and left sides and draw verticals and horizontals, as in Fig. 3. Erase the centre square and the corners of the outer square, and finish as in Fig. 1.

**Cut** a square of blue paper of the size of Fig. 1. If pupils have already studied the primary colors, purple may be used. Upon the back of the square trisect the sides and draw verticals and horizontals, as in Fig. 3. Cut out the cross and paste it in the Drawing-Book below Fig. 1, the upper edge of the upper arm of the cross being placed just on the printed horizontal. *Or*, draw very lightly a Greek cross of the size of Fig. 1, using the printed horizontal as the upper line of the upper arm, and color it red.†

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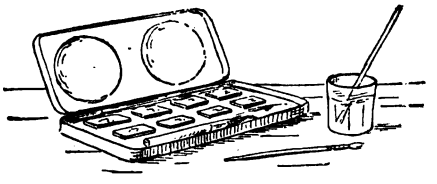
* Pupils may be led, if circumstances are favorable, to observe that churches are frequently built on the plan of a cross.

† For exercises in color, giving practice in the use of each of the three primary pigment colors, and also the relative amount of each used in composition of color, see page 61.



## OPTIONAL EXERCISE.

THE last page in the Drawing-Book may be used for an exercise on any part of the work in the book in which the teacher may think the pupils need further practice, or it may be given to an exercise in color.

**Color.** — The use of color in the study of form will be found of great value. Color exercises are therefore suggested for each book. The primary, secondary, and tertiary pigment colors and their combinations are presented in their order and with reference to their relative values.

Color-lessons should not be given at random. They should have an orderly succession and should have a twofold purpose: 1. The development of the color-sense; 2. The development of the power of expressing with brushes and paints, or other color materials, the color-impressions made upon the brain.

**The Color-Sense.** — In all schemes for color-lessons, the color-sense should be made the starting-point. Care should be taken that a color impression or sensation should *always* precede the *name* of the color. To this end, exercises in matching colors of objects should be given before color-names are given.*

**Tints, Shades, Tones, Scales.** — The children can also learn the *tints* and *shades* of these colors, and can learn to arrange them in *scales* of color.

*Tints* are those *tones* of a color lighter than the standard color.

*Shades* are those *tones* of a color darker than the standard color, obtained by mixing black with the standard color.

A *scale* of any color is made by arranging its tints, standard, and shades in successive order from light to dark or from dark to light.

A *dulled* scale is made by mixing gray with all the tones of the scale.

**Spectrum Colors.**† — A beam of light, passing through a glass prism, is refracted and decomposed, and when projected on a white screen is seen as a beautiful band of rainbow colors. This band is called the *solar spectrum.* The colors are so beautifully blended that it is hardly possible to determine where one ends and another begins. But the principal colors in the spectrum are generally spoken of as seven, — **red,** orange, yellow, **green,** blue, indigo, and **violet.** The latest researches of science show that red, green, and violet are the *primary* colors.

* Provision has been made for such exercises in the Color Chart and Cards for the Primary Education of the Color-Sense by Dr. Hugo Magnus and Dr. B. Joy Jeffries; published by the Prang Educational Company.

† The spectrum furnishes the standards of color. It has been the subject of much study by Mr. Prang, in order to use the results educationally. Prang's charts of Standard Spectrum Colors with their simple nomenclature will be of great value in color study.

in the spectrum, — that is to say, they are the colors by the combination of which the other colors of the spectrum may be produced.

In speaking of the colors of the spectrum, then, *red*, *green*, and *violet* must be considered as *primary* colors.

**Pigment Colors.** — But, in the use of such pigment colors as are now attainable, the mixing of colors does not produce the results reached by the combinations of the colors of the spectrum. The classification of the pigment colors, therefore, for the present at least, must differ from that adopted for the spectrum colors. In pigment colors, yellow, red, and blue are considered as *primary* colors. By the combination of these primary colors the secondary colors, orange, green, and violet, are produced, as has been already stated.

**Color Values.** — The various colors have not equal value; that is to say, two colors may be used in equal amounts, but the impression made by one will be stronger than that made by the other. The value of yellow is greater than that of red, and the value of red is greater than that of blue. The values of yellow, red, and blue have been estimated as in about the proportion of 3, 5, and 8. In any composition containing the three colors, they should be used in about these proportions. There should always be the least of yellow, more of the red, the most of blue, to produce the most pleasing harmony of color.

If the exercise indicated below is given, the page when completed will show three oblongs of the relative proportion of 3, 5, and 8, colored yellow, red, and blue respectively, thus showing the relative values of these colors. Some observations of values of color should be made by the pupils before taking up this exercise. For this purpose, the teacher should pin up, where all can see, three oblongs of paper of *equal* size, — one standard yellow, one standard red, one standard blue. It will be interesting to the teacher also to learn the preferences of the children as to the three colors, and to record the number who prefer yellow, the number who prefer red, the number who prefer blue. The authors of this Course would be glad to receive such records.

**Paints.** — While the children are receiving color-sensations, and learning color-names by the study of colored objects, they can also begin to produce color-effects by the use of paints.

Beginning with yellow, red, and blue, they can learn, by mixing these colors, the results produced.

YELLOW and RED, mixed, make ORANGE.
YELLOW and BLUE, " " GREEN.
RED and BLUE, " " VIOLET.

The three mixed in varying quantities produce browns and grays.

**The Use of Water-Colors.** — With a brush full of clean water obtain the full strength of color from the cake, and then transfer it to the spaces in the cover of the box as to a palette. Add color or water as strength or delicacy of tint is required.

Rarely mix more than three colors; and do the mixing upon the palette, and not upon the cakes. This is the best practice at first, though after obtaining a good knowledge of color, and skill in handling, it is sometimes better to work directly from the cake, mixing in the brush.

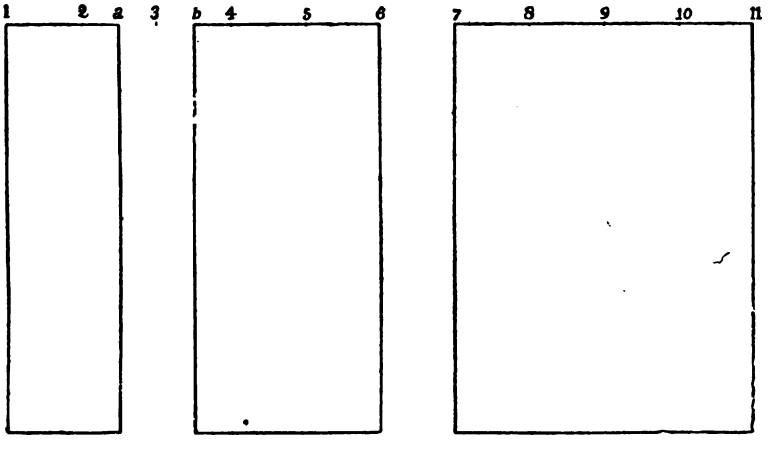
**The Use of Brushes.** — Be careful to use clean water, that is, water not charged with much color by previous mixing; and always put the brushes and box away quite clean.

A hollow sponge held in the left hand is useful to remove superfluous color from the brush, thus keeping the water clean.

Do not leave brushes in the water or put them in the mouth. When ready to put the brush away, wash it thoroughly in clean water, and give it a quick shake; this removes the water, while bringing the brush to a point and preserving its shape.

**Working in Water-Color.** — Do not let the surface of the paper lie flat, but slope the lower part toward you. Work from the left to the right, and from the top downward.

Keep the brush full of color, and work generally with the side of the brush, using the point only for lines. Surplus color can be removed, if taken up quickly, by using a nearly dry brush, blotting-paper, or a soft rag.



**Drawing-Book, *page 24.*— Exercise in Color.**

**Observation Exercise by Pupils.**— Who will tell me something about these oblongs? (*One oblong is yellow, one is red, one is blue. They are all of the same size.*) Those in the last row may answer now. In which oblong can you see the most color? Which is the brightest? Which next? What can I do so that you will see about as much *color* in one place as in another? (*You can take away some of the yellow and some of the red.*) From which shall I take the most? Which color do you like the best?

**Directions.**— Bisect the upper edge of the page, and an inch below the point of bisection place a point, thus dividing the page. Bisect each half, thus making four parts. Trisect each part. Mark each point of trisection. Are the spaces longer or shorter than inches? (*They are shorter than inches.*) Number these points, beginning at the left, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. Bisect the distances between 2 and 3 and between 3 and 4, and letter these points *a* and *b*. From points 1, *a*, *b*, 6, 7, and 11 draw verticals to within half an inch of the lower edge of the page. Draw horizontals from 1 to *a*, from *b* to 6, and from 7 to 11. Complete the oblongs by drawing the lower horizontals. Color the narrowest oblong yellow, the next one red, and the last blue. If paints cannot be used, these directions can be carried out by the use of colored papers. If yellow, red, and blue have been used on the previous pages, orange, green, and violet may be used on this page, but the diagram must be a little different. (For directions see page 125.)

## FORM STUDY AND DRAWING IN OTHER STUDIES.

MANY teachers are unaware of the great use that may be made of drawing in connection with other studies. A few suggestive thoughts are given here, and others will be found on page 126. It is hoped that these simple indications of lines of work will prove helpful to teachers. Detailed instruction will be found in manuals now in preparation on Form Study and Drawing in connection with other Studies.

**Number.** — If teachers will give pupils opportunities to *invent* and work out some illustrated exercises in number, they will be surprised to see how the thoughts of the pupil are quickened. These exercises should be in close connection with the work in drawing, and they will then act for good both on the lessons in drawing and on those in number. Thus the child will grow.

**Geography.** — The value of drawing, in connection with Geography, has long been recognized through map-drawing; through Colonel Parker's work at Quincy, and later at Cook County Normal School, and by the work of Charles F. King, Alexander E. Frye, Jacques Redway, and others, sand-modeling has now become well known as a means of acquainting children with the physical features of the earth. Colonel Parker also makes a strong plea for drawing what has been modeled. He says, "*Draw, draw, and keep on drawing.*" Much may be done at this stage in geographical modeling both with sand and clay, and in drawing. The regular exercises in the study of models and in drawing in Book I. will bring such geographical exercises within the ability of the pupils.

**Manual Training.** — Both educators and practical men are now seeking the introduction of manual training into regular school work. Such training will, however, fall short of the desired results, both educational and practical, unless pursued in connection with regular systematic, thoughtful work in Form Study and Drawing, as Form is the basis of all work in manual training. Beautiful form as well as good workmanship should be sought in all work in manual training. To some, manual training concerns only the actual processes of construction, with the attendant thought and necessary skill. This should not be so; every lesson in manual training should be a lesson leading toward beauty of form and also to harmony of color where color is used.

**Language.** — Language lessons should be both oral and written. They should at first concern things most apparent to the senses, gradually leading to imaginative work and more abstract thought. The materials for Form Study — the solids, tablets, decorative figures, and arrangements — present the most admirable material for developing language. This development should begin with the pupil's observation and description of his own *action* with the models (as being the most real to him), then of

the action of another; observation and description of things, — models, and objects should follow; then figures, then arrangements. Pupils should be encouraged to illustrate their written work whenever it is possible. *Complete sentences* should be required in oral as well as in written language.

The terms developed in the use of Drawing-Book I. are grouped here for convenient reference to be used in language work: —

**Terms of Location, Direction, Position, Seeing, Length, Division, and Proportion.**

LOCATION. — Left, right, top, bottom; left edge, right edge, upper edge, lower edge; upper left corner, upper right corner, lower left corner, lower right corner.

DIRECTION AND POSITION. — From left to right, from top to bottom, from corner to corner; circular, curved, straight; vertical, horizontal, oblique.

SEEING. — The part toward you, the part away from you; top view, front view.

LENGTH. — Long, short, equal; one inch, two inches, three inches, etc.

DIVISION. — Bisect, trisect.

PROPORTION. — 1 to 2, 2 to 3.

**Names of Models, Objects, Arrangements, and Details.**

SPHERE, CUBE, HEMISPHERE: face, edge, corner.

CIRCLE, SEMICIRCLE, ARC: centre, diameter.

APPLE: stem, blossom.

KITE: axis of symmetry.

SQUARE: diameter, diagonal; on its side, on its corner.

ANGLE: right, acute, obtuse.

REPETITION: on an axis, in a straight line, around a centre; border, shield, cross, quatrefoil.

LEAF: plantain leaf; rib, midrib, apex, margin.

COLOR: yellow, red, blue.

# SUGGESTIONS TO TEACHERS

FOR

# THE USE OF THE MANUAL.

THE text for each exercise is divided into three parts, and each part has its special purpose. For the purpose of clear distinction each part is presented in a particular size of type.

**For information with regard to the subject and the special topic of the exercise,** the matter in large type should be studied. It will be noted that at the close of this part of the text, the special points to be developed with the class are given.

**For suggestive methods of developing in the minds of the pupils the ideas of the exercise,** the matter in smaller type headed "Study of Models by Pupils" and "Observation Exercise by Pupils" should be studied.

**For definite statements as to the drawing to be done,** the matter headed "Practice" and "Direction" should be studied.

It is earnestly hoped that teachers will not look upon the manual text either in its Suggestions or its Directions as something to be rigidly followed, but that they will strive to learn and apply the method and spirit of the work in the instruction of their classes. The attention of teachers is especially called to pages 3, 4, and 36, regarding the method and spirit of this work.

NOTE. — As pupils now receive in the first two years of school good instruction in Form-Study and Drawing, guide points and some illustrative diagrams necessary in the early edition of Drawing-Books I. to VI. are omitted in the later edition. It will be necessary, therefore, for teachers to make the slight adaptation in the instructions in the Manuals for the various exercises which is needed to meet the changed conditions. The drill exercises and practice pages, given in the Manuals as preceding the regular exercises, are to be drawn upon practice paper by pupils using the later edition.

# BOOK II.

## Models.

SOLIDS: Cylinder, Square Prism.
TABLETS: Circle, Square, Oblong.
NATURAL FORMS: Vegetables, Leaves.
OBJECTS: Tumbler, Envelope, Fan, Shield.

## Decorative Figures.

ORIGINAL DESIGN, SQUARE-LEAVED QUATREFOIL.

## Making.

FROM A PATTERN: Square Prism, Envelope.

## Drawing.

PENCIL-HOLDING, MOVEMENT, LIGHT LINES, ERASING, BROAD GRAY LINES.

## Language.

(See page 127.)

NAMES OF MODELS AND DECORATIVE FIGURES AND THEIR DETAILS. TERMS OF RELATION, PROPORTION, VIEWS, ARRANGEMENT.

## Color.

THE THREE SECONDARY PIGMENT COLORS.

## DRILL EXERCISES.

Drawing-Book, *page 1.*

**OBJECT. Practice for proper position of pupil and of paper; proper pencil-holding; free-arm movement from top to bottom, from left to right, and from corner to corner.**

**Practice Paper.** — It is desirable that pupils should have some practice in movement and drawing before beginning work in the Drawing-Book. For this purpose use sheets of manila practice paper, six by nine inches.* This manila paper will also be found useful for practice previous to many of the exercises throughout the Drawing-Book, as well as for folding. The sheets should be used upon both sides. Provision should be made for from twenty-five to thirty sheets for each pupil for use with one Drawing-Book.

**Drill Exercises Necessary.** — In order to draw well, two things are necessary, — a knowledge of the thing to be drawn, and skill of hand to draw. Study, then, not only the object to be drawn, but endeavor also to attain SKILL of hand to draw. The teacher should seek to become ready in drawing, and should carry out the exercises given to the pupils.

Skill of hand cannot be attained without repeated practice. It is not enough that the mind wills the hand; the muscles must be trained to obey. Hence, throughout this series frequent drill exercises are given to afford practice for proper pencil-holding, free movement, and ready drawing.

The first exercises chosen are simply in movement directly *from top to bottom, from left to right, from corner to corner*, and also *round and round;* they should be given first on practice paper, then in the Drawing-Book. The first steps preparatory to these exercises are very simple; but they are essential to success, and should therefore be practiced with great faithfulness.

**Movement.** — Before beginning work on the paper, show pupils how to hold their pencils for free movement and drawing. Free work both in movement and drawing is of the greatest importance; for drawing, to be valuable, must be free and ready. Give practice in taking up the pencil (see page 3.) Give practice in movement from back to front on the desk with the pencil, and see that *each pupil* holds the pencil properly (see Fig. 1, page xii), — the same for movement from left to right (see Fig. 2, page xii), and from corner to corner (see Figs. 3 and 4, page xii). To keep the children together for movement, count as follows: One, back; two, back; three, back. Endeavor to make the whole movement unbroken; therefore count in even time.

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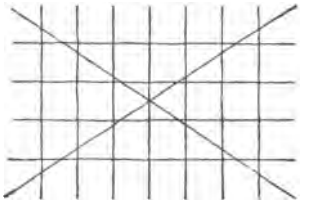
* A special paper has been made for this purpose and is put up in packages of one hundred sheets, and may be obtained of booksellers and of The Prang Educational Company.

**Practice.** — The books and practice paper, one sheet for each pupil, may now be distributed. The pupils may open their Drawing-Books at page 1, read the figures at the top and the letters at the left of the page. The points are an inch apart. The book may then be moved to the back of the desk, and the paper placed in front of the pupil, with long edges from left to right. Looking carefully at the inch in the Drawing-Book, each pupil may place a point that shall be an inch from the upper edge and from the left edge. Beginning at this point, lines an inch apart and ending an inch from the lower edge may be drawn down the page at the count of the teacher, movement being practiced first. When counting for movement for straight lines and drawing combined, count as follows: One, back; two, back; three, ready; draw. The movement can be made as many times as seems desirable, — generally not less than three nor more than five times before drawing, — but the word for the last movement back should be *ready*, that pupils may be prepared to draw. Beginning again at the first point, lines an inch apart and ending an inch from the right edge of the paper may be drawn across the page at the count of the teacher, movement being practiced first. Beginning at the first point again, a line may be drawn in a similar way to the lower left corner; and beginning at the upper right corner, a line may be drawn to the lower left corner. If it seems necessary, another sheet may be taken; pupils having placed the first point, may place light points an inch apart at the right of and also below the first point, and repeat the exercise on each side of the sheet. The papers may now be gathered and carefully preserved, and work may be begun in the book. The directions below are to be given to the pupils.

**Length of Exercise.** — As the purpose of the drill exercises is to give practice in free movement and ready drawing, it would be a great mistake to make these exercises long. No one of the drill exercises given here should occupy ten minutes, and the best results in the end will be reached if not more than five minutes is spent. The children will soon become anxious to produce good work in the shortest space of time.

**Practice.** — Sit up straight, and with pencil in hand, held properly, begin at point 1, and move the hand down the page (without drawing and with the whole arm movement) as the teacher counts; then draw lightly down the page with one continuous movement. Repeat the movement and drawing, from points 1, 2, 3, 4, 5, 6, 7, — remembering to hold the pencil properly. *No erasing.*



Drawing-Book, page 1, completed.

Draw from points *a*, *b*, *c*, *d*, across the page, remembering pencil-holding and movement as the teacher counts.

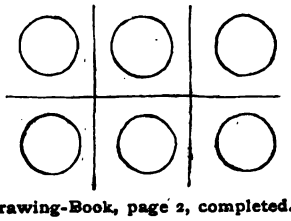
Draw also from the upper left to the lower right corner, and from the upper right to the lower left corner, with proper pencil-holding and movement. *No erasing.*

**Drawing-Book, *page 2.*— Drill Exercise.**

**OBJECT. Free-arm movement, and drawing round and round.**

**Free Movement.** — Give directions for holding the pencil for movement round and round with the pencil pointing toward the left, as if for drawing a vertical line, and for practicing the movement on the desk (see Fig. 5, page xiii). The pencil must be held the same throughout the movement. Count, One, two, three, four, etc., counting but *one* for each circular movement. For the last complete movement before drawing, say *ready*. The counting will then be, One, two, three, ready, draw. After practicing the movement on the desk, the books can be distributed, and the following directions carried out.

**Practice.** — Draw with free-arm movement lines from *b* and *c* down the page, and a line from *a* across the page, dividing it into six parts. Think of a circle of good size in each part.



**Drawing-Book, page 2, completed.**

In the upper left-hand space, beginning at 1, and moving in the direction 1, 2, 3, 4, 1, 2, etc. (see Fig. 5, page xiv), practice the movement for a circle as large as the space will allow, then draw a circle with one sweep, always pointing the pencil toward the left, moving and drawing at the count of the teacher.

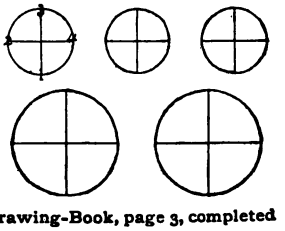
Repeat in the other spaces, striving to make each circle better than the last. *No erasing.*

**Drawing-Book, *page 3.***

**OBJECT. Practice in drawing circles on their diameters with free-arm movement.**

**Diameter.** — The diameter of a circle is the longest straight line that can be drawn in a circle. It always passes through the centre. The meaning of the word diameter is *measure through*. Any number of diameters can be drawn in a circle. When it is desirable to fix the size of a circle, diameters are used.

**Practice.** — Practice movement 1, 2, 3, 4, over the printed circle as the teacher counts, holding the pencil long as shown in the illustration, page xiii, and in the direction indicated by the illustration, Fig. 5, page xiv. Practice a similar movement on the next two diameters given, then draw a circle with one sweep of the pencil as the teacher counts. Repeat on the next two diameters. Practice movement now for a larger circle, on the two diameters at the left, below, and draw the circle with one sweep of the pencil as the teacher counts. Repeat on the other diameters. *No erasing.*



**Drawing-Book, page 3, completed**

## EXERCISE I.—Study of the Cylinder.—Two Views.

MODELS: *Sphere, Cube, Cylinder, Circle, Oblong.*

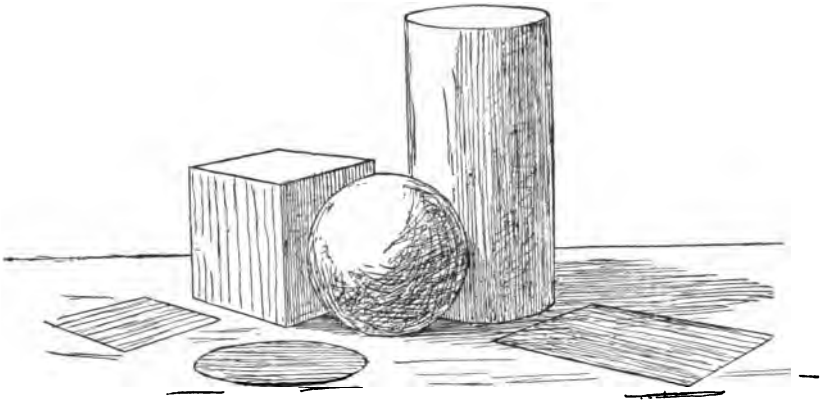
**OBJECT. To study the general form of a cylinder; to see the shape of its various views; to draw the views.**

IN many cases where these books will be used, the regular teachers have been prepared for the work by training and experience, and the pupils have received instruction in the first two primary years of Form Study and Drawing according to the Primary Manual called "The Use of Models." In many other cases, the regular teachers who are called on to teach these books have had no opportunity to become acquainted with the method or the subject-matter of the primary work of "The Use of Models." Again, the children may not have had the primary instruction, or may have received it only to a very limited extent.

It has been the endeavor, therefore, in preparing the text for these Manuals to consider the needs of both teachers and pupils who have not had previous practice or training. The text under each exercise consists of three parts, the first part, in large type, relating to the subject-matter necessary for the information of the teacher; the second part, in smaller type, to the method of developing these ideas in the minds of the children; the third part, in still smaller type, relating to directions for carrying out the drill and the drawing exercises. The exercises given for Study of the Model and for Observation by the Pupils are given as suggestions. Teachers will supplement and vary these exercises by their own skill and tact and through their knowledge of child-nature. If the pupils are beginners, the teacher must be careful to lead them to such observation as will enable them to discover and recognize the leading characteristics of a form or of a detail before giving the name. If pupils have been already prepared in the work, the earlier exercises in the Drawing-Books may be treated as review exercises by the teacher.

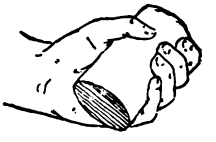
The method of the teacher should always be to lead the children to discover and express for themselves all that they can about the form to be studied. Thus they will become both receptive and expressive. Therefore do not tell the children what they can find out; direct their observations, their thoughts, and their expressions, however, by skilful questions and exercises; remember also that drawing, as well as language, is a means of expression. The following exercises are given as suggestions; in order to carry them out well, see that each pupil has a model, so that each one can study and discover by touch as well as by sight. Do not give a question that will lead a pupil to repeat what you have said, but give questions that will lead to thought on the part of the pupil. Be careful always to obtain a complete sentence as an answer to any question.

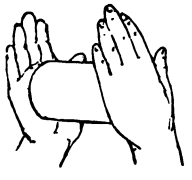
**The Cylinder.** — The sphere was chosen as the first form for study in Book I., because it is the simplest and the best known of all the type forms.



The cube was taken as the next solid, because it is the most simple form next to the sphere. It is also the type which is the form most like and the most unlike the sphere, with which it should be compared.

The cylinder is now taken because it is also a simple and a very familiar form. It is somewhat like the sphere; it is also somewhat like the cube. If you grasp the cylinder you find that the fingers close readily around it; you feel no unpleasant edges, — in this it is like the sphere. You can roll it between your hands. You can roll it on your desk. In this it is somewhat like the sphere. But if you hold it endwise between the hands, or stand it upright upon the desk, you find it somewhat like the cube.





The sphere has one *round* face; for it is perfectly round in every direction, and its surface (the whole outside) is unbroken by an edge. The cube has six *plane* faces; for its surface (the whole outside) is broken into six parts which are perfectly flat. Pass your fingers over the surface (the whole outside) of the cylinder, and you will find that the surface has three parts, or faces; two of them are *plane* faces. Compare the other face with that of the sphere. Roll the sphere; it will roll in any direction. Lay the cylinder on your desk and roll it; it will roll only back and forth. If you pass your fingers over the sphere, you find that they will move always around it and never along it; while on the face of the cylinder on which it rolls, your fingers will move around one way and along one way. A face that is round one way and straight one way, like this face of the cylinder, is called a **curved face.**

Observe now the plane faces. Their shape is that of a circle. The outline of a sphere is like that of a circle. Observe next the curved face. Hold the cylinder in the left hand, and trace the shape with the first finger of the right hand. Begin at the bottom of the left side, move up to the top, straight across the plane face, down the right side, and across the bottom to the place where you started. Repeat this, and then make the shape in the air. The shape of the outline is that of an oblong.

**Geometric Views.** — Study now the different geometric views of the cylinder. A *geometric view* of a model or an object is a view that is obtained when but two dimensions of a model or object are visible. A *front view* of a model or object is obtained when the model or object is directly opposite the eyes; a *top view* is obtained when the model or object is directly beneath the eyes; a *bottom view* is obtained by looking directly up at the model or object; a *left-side view* is obtained by looking directly at the left side, and a *right-side view* by looking at the right side.

Hold the cylinder upright directly opposite the eyes, and you will have the front view of the upright cylinder. The front view has the outline of an oblong. If this does not seem quite clear to you, trace the outline again as directed above. Also hold the cylinder between you and the light; consider the shape of the outline only, and you will see it as an oblong. It may be a little difficult for you to get the front view of the cylinder, as it is perhaps somewhat different from your previous thought of the cylinder; but the children will not find it difficult. Hold the upright cylinder at the waist, look down upon it; you will see the top view, a circle. Hold the cylinder horizontal from left to right, — the left-end view is a circle; the front view is an oblong. Look directly down upon the cylinder; the top view is also an oblong.

**Drawing.** — Draw the views lightly but freely in the Drawing-Book. Erase errors, and finish the drawings with a soft, gray, even line. In drawing any object, the texture should always be considered. When the object is finished with great regularity, as these models are, the lines should be firm (but not hard and wiry) and of even width throughout their length. It is well, in finishing a page of drawings, to draw all lines of one direction before passing to any of another, as thus the feeling of the direction is kept, whereas by constant changing it would be lost.

**To be developed. — Form of model; use of name, cylinder; number of faces; kind, curved, plane; proportion; front view, top view; drawing the views; quality of line.**

**Suggestions for Study of the Models by Pupils.** — Take the sphere in one hand and the roller in the other. Pass the fingers around the sphere and along the roller. What do you notice? (*The sphere is round in every direction; the roller is round in only one direction.*) Roll the sphere; roll the roller. How do they roll? (*The sphere rolls*

*in any direction, the roller in but one.*) How will they stand best? Can you tell what the roller is called? (*The roller is called a cylinder.*) What can you see like a cylinder?

How many faces has the sphere? (*The sphere has one face.*) What kind of a face has the sphere? (*The sphere has a round face.*) Move your fingers over the faces of the cube. How many and what kind of faces has the cube? (*The cube has six plane faces.*) How many and what kind of faces has the cylinder? (*The cylinder has three faces, — two plane faces and one curved face.*) How wide is the cylinder? (*The cylinder is one inch wide.*) How high is the cylinder? (*The cylinder is two inches high.*) What is the proportion of the width to the height? (*The proportion of the width to the height is* 1 *to* 2.)

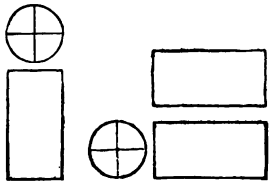
Hold the cylinder upright opposite your eyes; how much of the curved face can you see? (*I can see the part towards me.*) Trace the outline of that part in the air; begin at the bottom of the left side, move up to the top, *straight across* the plane face, down the right side, and across the bottom to the place where you started. Find a tablet having the shape of this outline. What is the shape of the tablet? (*The tablet is higher than it is wide.*) Can you tell what the tablet is called? (*The tablet is called an oblong.*)

**Drawing-Book, *page 4.* — Drawing Geometric Views of the Cylinder.**

**Study of the Model by Pupils.** — Hold the cylinder upright opposite your eyes; what view of the cylinder have you? (*I have the front view.*) What is the position of the cylinder? (*The cylinder is upright or vertical.*) What is the shape of the front view? (*The shape of the front view is oblong.*) Look down on the top of the cylinder; what view have you? (*I have the top view.*) What is its shape? (*The top view is circular.*) What tablet has the shape of the front view? (*The oblong tablet has the shape of the front view.*) What tablet has the shape of the top view? (*The circle has the shape of the top view.*) Can you draw these two views on the board? Draw first the top view. Where will you place the front view? Observe a horizontal cylinder in a similar way to obtain the left-end, front, and top views.

Pass your fingers down the sides of the model, along the edges of the model; pass your fingers lightly over your sleeve from the elbow down. Do you notice any difference? (*Yes; the model is firm and smooth; my sleeve is softer, and there are some wrinkles in it.*) Try to draw a firm, even line when drawing the model.

**Directions.** — The top view of a vertical cylinder is given. Draw the front view.



**Drawing-Book, p. 4, completed.**

How wide should the front view be? (*The front view should be as wide as the top view.*) How high should the front view be? (*The front view should be twice as high as wide.*) Think of this proportion. Draw the sides of the front view, obtaining their place by movement downward from the ends of the horizontal diameter of the top view. Using the angle given, draw horizontals, first practicing movement.

The front view of a horizontal cylinder is given. Think of its left-end and top views. Draw these views, practicing movement first. Get the length of the top view by movement upward from the verticals of the front view. Finish with soft, gray, even lines. Finish the circle first, then all the verticals on the page, then all the horizontals.

## EXERCISE II.—Three Views of a Horizontal Cylinder.

MODELS: *Sphere, Cube, Cylinder, Circle, Oblong.*

**OBJECT. To study further the general form of a cylinder; to see the shape of its various views; to draw the views.**

**The Sphere, Cube, and Cylinder.** — This combination of models is familiar to all who know anything of kindergarten work. They are the first models given in the kindergarten. The sphere and cube are first studied as to resemblances and differences; the cylinder is then introduced as the "mediation" between the sphere and the cube. The "mediation" of opposites was a leading principle with Froebel. The cylinder chosen by Froebel has equal dimensions, like the sphere and the cube; that is, it is just as wide as it is high. It therefore serves, as to dimension and as to nature, as an exact "mediation" between the sphere and the cube, partaking of and combining the nature of both. The sphere will stand and will roll. The cube will stand and will slide. The cylinder will stand and will roll and will slide.

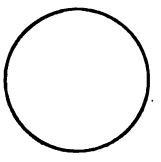
The nature of both the sphere and the cube requires that they shall measure equally from front to back, from left to right, from top to bottom. The cylinder, however, is not so restricted. Its height or length may be of any proportion to its width. Thus a wire, an unsharpened lead-pencil, a rolling-pin, a street-roller, a collar-box, a coin, are all cylinders, although of such different proportions. They all have three faces, — two plane, one curved. As the form of the cylinder allows of so great a variety of proportions, a simple yet pleasing proportion was chosen for the cylinder in the Prang Sets of models. This element of proportion (which is, in art, the pleasing relation of unequal parts) adds much to the beauty of the cylinder. Beauty should always be considered in the preparation or selection of materials for Form Study.

These three models may be used to form a group. If they were placed side by side, near together or touching, a row would be made. A row is a good thing for the sake of order and for the arrangement of large collections of things; but if you have two or three objects which you wish to use somewhat by themselves to produce a pleasing effect, you will hardly place them in a row. Try grouping these three models. In forming a group you will of necessity put one a little further forward than the others. You will not wish, however, to give a straggling effect, therefore you will place them rather compactly; but in this way a portion of two of the models will be hidden. This will not detract, however, from the beauty of the group; it will rather add to it, for it

will appeal to the imagination to complete the parts of the models hidden. Grouping the models is a good exercise for pupils; it prepares the way for later work in arranging and drawing groups of models and objects.

It is extremely interesting to find the recognition of the sphere, cube, and cylinder in the tomb of a Japanese ruler who died in the seventeenth century. La Farge, the artist, thus describes it: "The tomb is of pale golden bronze, in form like an Indian shrine, — a domed cylinder surmounted by a great projecting roof which rises from a necking that separates or connects them; above the roof a finish in the shape of a forked flame. Five bronze steps, or bases, support this emblematic combination of the cube, the cylinder, and the globe."

**Study of the Cylinder.** — It is important that the study of the models should not be one-sided and devoted wholly to facts and views. The cylinder should be studied not only as to the shape of its faces and geometric views, but also as to other aspects. Turn the cylinder in many directions; however you turn it, you can see not more than one plane face and half of the curved face. Hold it upright and sufficiently below the eye to have the top face in sight. You will see that the top face does not look like a circle, which it really is, but like an ellipse, which it appears to be. Hold it upright and sufficiently above the eye to have the bottom face in sight. You will observe again that the circular face appears like an ellipse.



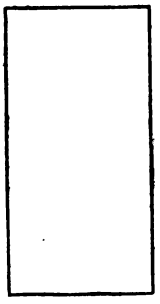


Fig. 1.

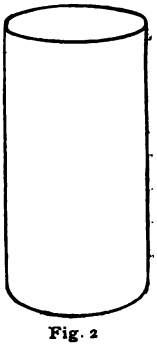


Fig. 2

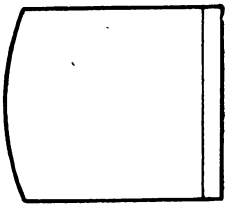
A similar study of the part visible, and of the appearance of the circular faces when seen obliquely, should be given to the children. The truth of the facts and the truth of the appearance should receive equal attention, so that one shall not obscure the other in the mind of the pupil. Great pains must be taken, however, not to force this seeing the true appearance of objects; unless it comes as what the pupil observes, it will be useless. It would be great folly to tell a pupil what to see. The part of the teacher is to find out what the pupil sees, not to tell him what he ought to see. Fig. 1 shows the top and front views of the upright cylinder; Fig. 2, its appearance when placed below the eye on a square tablet.

**Objects like a Cylinder.** — In Nature, the trunks of trees are like a cylinder; those parts of the limbs between the offshoot of one branch and that of another, of the branches between the twigs, of the twigs between the nodes, are like a cylinder. A node is the point on a stem where a leaf starts. The cylinder is a favorite form in many ways. Handles are generally cylindric, as a cylinder can be so

comfortably grasped and held; from the handle of a baby's rattle to the handle of a crowbar, the cylinder prevails. Penholders and pencils are like cylinders.

A hollow cylinder is also a favorite form for many receptacles. Music-rolls, traveling-rolls, needle-books, etc., are found in the form of a cylinder. Cans of various sorts are cylindric. Napkin-rings, umbrella stands, pails, cups, etc., are like a cylinder. Boilers, gasometers, cisterns, are like a cylinder. The form of all binding material is generally that of a cylinder, as wire, string, cord, rope. Conduits are generally of the form of a cylinder, as water, gas, and steam pipes.

It is intended that three views of the horizontal cylinder shall be studied and drawn for this exercise. If the pupils have had previous study of the cylinder, and know it fairly, it may be well to give for this exercise, the study and drawing of a simple object like a cylinder. A model representing a music-roll could be easily improvised. Procure a sheet of wrapping paper about fourteen inches wide, and cut it in the shape illustrated. A band of tape to hold it rolled would also be necessary. The left, top, and front views are illustrated (Fig. 1). A music-roll with a handle would be interesting, but much more difficult (Fig. 2). A botanical box for carrying flowers would be a better object for this stage, but perhaps not so easily obtained (Fig. 3).



It will enlist the interest of the children very much if they are asked to suggest some object like a cylinder which could be used as a model here, to be studied for its different views. A length of stove-pipe would serve well as a model here.

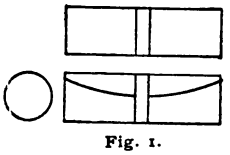


Fig. 1.

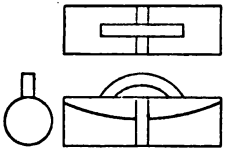


Fig. 2.

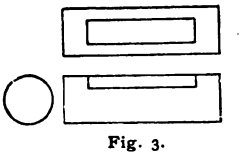


Fig. 3.

This exercise, like most of the others, contains many suggestions for language lessons. One requirement might be to write sentences mentioning objects like a cylinder. Each of the three objects illustrated in Figs. 1, 2, and 3 suggest little stories that might be written and illustrated by three views of an object.

**To be developed. — Truth of facts; truth of appearance; front view, top view, end views; objects like a cylinder; drawing two views; quality of line.**

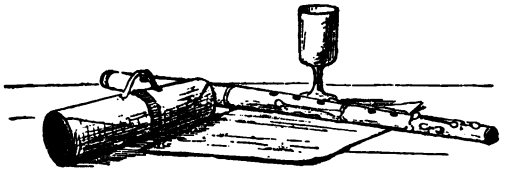
**Suggestions for Study of the Model by Pupils.** — Turn the cylinder in various positions. How much of it can you see at one time? What is the most that you can see

of the curved face? Hold the cylinder upright opposite the eye. What is its front view? its top view? Hold it upright and slightly below the eye. How does the top face look? How does the nearer half of the upper edge appear? (*It appears to curve downward.*) How does the front half of the lower edge appear? (*It appears to curve downward also.*) Which appears to curve the more? (*The lower edge appears to curve the more.*)

Hold the cylinder horizontal from left to right. What is its front view? its top view? its left-end view? its right-end view?

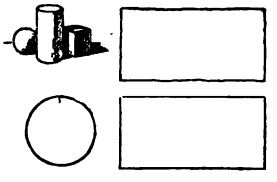
(If some cylindric object is chosen for the exercise, a study of that object as to proportion and views should follow.)

**Drawing-Book, *page 5.*—Drawing the left-end and top views of a Horizontal Cylinder.**



**Observation Exercises for the Pupils.** — What does the picture in the Drawing-Book represent? How large is the picture? Make a pleasing group of your models. Place your models to look like those in the picture in the Drawing-Book.

Mention objects cylindric (like a cylinder) in form, — objects in the room, objects that you can remember. Can any one make a cylinder at home?



**Drawing-Book, page 5, completed.**

**Drawing.** — The front view of a horizontal cylinder is given. Draw its left-end and top views, according to the directions given in the preceding exercise, using the points given. Erase the diameters in the left-end view and finish the left and top views.

If a cylindric object is taken instead of the model, the teacher should plan the placing of the views before giving the lesson. If the object is long and narrow, the lower line of the printed front view can be used for the lower line of the front view of the object. The upper line of the front view of the object can be drawn within the printed oblong at the proper height. That part of each vertical above this line can be erased partially. The upper line of the printed oblong can then be used for the lower line of the top view.

## EXERCISE III. — Square Prism. — Drawing the Pattern.

MODELS: ***Square Prism, Square and Oblong.***

**OBJECT. To study the square prism; to work out the pattern; to draw the pattern; to make a hollow square prism.**

**The Square Prism.** — The square prism is a very regular model. Like the cylinder, it has always two of its dimensions equal, and the third variable. Place the cylinder and the square prism upright. You will see that the cylinder measures the same from front to back as from left to right. The case is the same with the square prism.

All type forms except the sphere, cube, and hemisphere may vary in proportion and yet keep their form characteristics. The sphere and cube must each, by their form-nature, have their three dimensions equal. The hemisphere must always be in the proportion of 1 to 2. In planning the Prang models, it was thought best to have a simple, pleasing, definite proportion between width and height throughout the other models of type forms, as far as possible. The proportion determined for use was 1 to 2. This proportion is the first in a series, leading to the most subtile proportion. The series is 1 to 2, 2 to 3, 3 to 5, 5 to 8, 8 to 13, 13 to 21, etc. While the ratio of any two members of this series is not the same, yet each successive pair approach each other in ratio, as will be seen by comparison. The proportion, 1 to 2, is the simplest as well as the first in the series. It is easily comprehended and easily expressed. The models of the cylinder and the square prism are in this proportion. By the use of this proportion and of the inch as a standard of measurement, the cylinder and square prism and the other models become standards, and present two definite measurements in each size of the models. The smaller size gives one inch and two inches, the next size gives two inches and four inches, the largest size gives four inches and eight inches. Thus the children may gain, while handling the models, the most definite notions of absolute size. It would be wrong, however, to conclude that cylinders and square prisms must be always in this proportion.

But while the two models agree in having two of their dimensions equal and the third variable, they differ in the number and shape of faces or of parts of faces, visible. The cylinder has three faces, — two plane and one curved; the square prism has six faces, all of which are plane. Two faces are square and four are oblong. The square prism presents an excellent opportunity for number lessons. The whole number of faces, the number of square faces, the number of oblong faces, the proportion of the square faces to the oblong faces, of the edges of an oblong face to each other, etc., will furnish much number work.

**The Pattern.** — A pattern of a square prism is now desired. For an explanation of patterns, see page 9. The pattern of a square prism can be developed by creasing the faces in paper. In this exercise the pupils can join. It is better, as far as possible, to have the pupils develop all exercises first through their own activities, as the work then lays stronger hold of them than if they simply observe what you do.

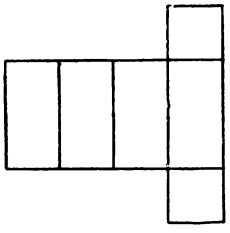


Fig. 1.

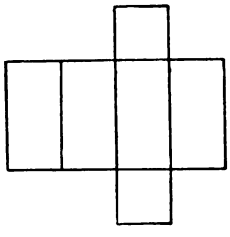


Fig. 2.

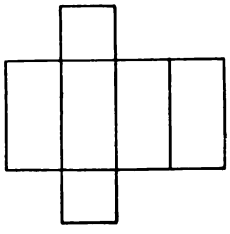


Fig. 3.

The pattern may also be developed before a class by placing an oblong face of the model upright against the blackboard and rolling it from face to face until each of the four oblong faces has touched the board, then turning it up till the upper square face has touched the board, then down until the lower square face has touched the board (see Fig. 1). In making the real pattern the square faces may join any one of the oblong faces. In making a pattern, however, as in all form work, it is best to seek always the most pleasing arrangement of details. Symmetry must guide us here. A pattern like Fig 2 or Fig. 3 is more agreeable than one like Fig. 1, as it balances better. In Fig. 1 the apparent weight is thrown on one end of the pattern, while in Figs. 2 and 3 the weight is more evenly distributed. A pattern is sometimes according to the extent of material. If you had only a long narrow piece of paper, the pattern of the square prism might be made as in Fig. 4.

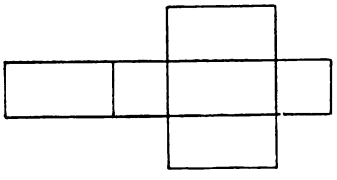


Fig. 4.

**To be developed.** — **Form of model; use of name, square prism; square, oblong; pattern of square prism; drawing the pattern; quality of line.**

**Suggestions for Study of the Model by Pupils.** — How does this model compare with the cylinder? How many faces has it? What kind of faces? (*Its faces are plane.*) What is the shape of the faces? (*Two are square, four are oblong.*) What is the model called? (*The model is called a square prism.*)

**Making the Pattern.** — (The teacher recalls or develops the idea of a pattern, page 9.) How many faces has the square prism? What is the shape of the faces?

What is an oblong? (*An oblong is a figure having four sides — two longer, two shorter — and four right angles.*) Of what figures would you make the pattern for a square prism? (*Of four oblongs and two squares.*)

Place the square prism on a sheet of paper on an oblong face. Turn up the paper around the oblong and square faces of the prism and crease it, to get the snape of the faces in the paper.

**Drawing-Book, *page 6.* — Drawing the pattern of a Square Prism.**

**Observation Exercise for Pupils.** — What is Fig. 1 on the Drawing-Book page? Fig. 2? Fig. 3? If Fig. 3 were unfolded, would it be like Fig. 1? Having an oblong given as one face of a square prism, how would you draw the pattern of the prism?

**Directions.** — The printed oblong corresponds to the second face in Fig. 1. Draw the pattern as in Fig. 1, using the point given at the left, — first the long horizontals indefinitely and continuously over the printed lines, then the verticals, finishing with the short horizontals. Long pencil-holding and free movement.

**Prang's Pattern Sheet, No. 3. — Making a hollow Square Prism.**

What is printed on this sheet? (*The pattern for a square prism.*) Cut out the pattern, taking care not to cut off the laps. Write your name neatly on an oblong face. Fold the pattern so as to make a square prism, and paste it together, being careful to fold and paste the laps within the prism.

**Making a Box.** — An illustration is given below of the pattern of an envelope, Fig. 1, and of the same envelope folded, Fig. 2. It will be seen that the tongue seen on Fig. 1, at the left, serves to fasten the envelope when closed, as in Fig. 2. The envelope is pasted across the bottom, and up the vertical line to the notch. This device has been patented, and the envelope is used largely by manufacturers and merchants in sending out samples by mail. A box can be made from stiff paper, having the form of a square prism, and a cover like that in Exercise XII., Book I., which can be fastened with a similar device.

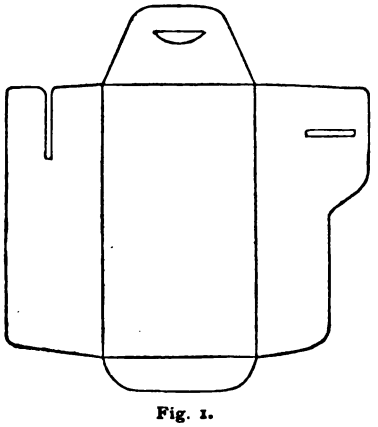


Fig. 1.

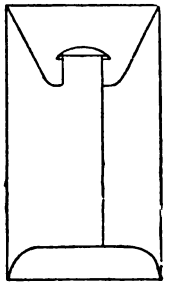


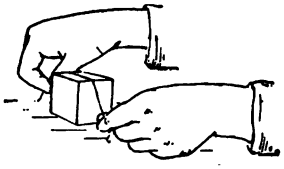
Fig. 2

## EXERCISE IV.—Square Prism.—Two Views.

MODELS: *Cube, Cylinder, Square Prism, Square, Oblong.*

**OBJECT. To study the form of a square prism; to see the shape and proportion of some of its views; to draw these views.**

**The Square Prism.**—A square prism may be made either by division of a cube or by combination of cubes. Model a cube in clay; bisect it vertically from left to right; lay one half over at the front and one at the back. You have two square prisms that are not as high as wide. A square prism that is not high as wide is called a **square plinth.** Place the two plinths together so as to form a cube again, as in the first place. Bisect from front to back; you have four square prisms higher than they are wide. These may be called square columns. A square prism has two square faces, called its bases, opposite and parallel to each other; it also has four other faces, each pair of those faces being opposite and parallel. Applying this description, you will see that square plinths, cubes, and square columns are all square prisms.

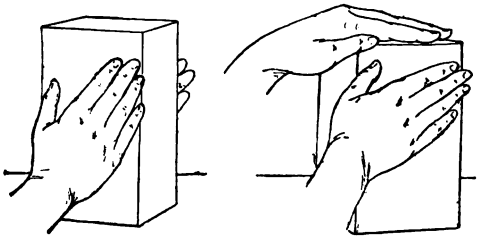


Place four cubes so that two faces of each cube will each be touched by a face of another cube, and you have a square prism which is a square plinth. Put one cube on another, and you have a square prism which may be called a square column.

As has been said, the proportions of a cylinder and of a square prism may vary to any extent. The proportion of a cylinder may vary from that of a wafer to that of a telegraph post or a telegraph wire. In like manner, the proportion of a square prism may vary from that of a tile to that of a beam. A cube is a square prism, having its bases equal squares and four other square faces, each pair of which faces are opposite and parallel. But as the cube has its distinctive name, it is not generally spoken of as a square prism. The name *square prism*, like the name *cylinder*, is generally applied to objects which are higher than they are wide. A cylinder that is not as high as wide is called a **circular plinth.** There is no distinctive name for the cylinder that has its three dimensions equal.

**The Model.**—Observe the model. It has two equal square faces and four equal oblong faces. An oblong face is longer one way than the other. The square faces are opposite; each oblong face has its opposite. Place the model vertical. Pass your fingers up and down any two of its opposite, oblong faces; they are everywhere the same distance apart; they are **parallel** to each other. The left and right faces are *parallel* faces; the front and back faces are *parallel* faces. The top and bottom faces are parallel.

Move your fingers toward each other on any two adjacent faces of the square prism. You find that the faces meet so as to make a square corner. They are **perpendicular** to each other. Each square face is *perpendicular* to four oblong faces. Each oblong face is *perpendicular* to two square faces and two oblong faces.



These two terms, *parallel* and *perpendicular*, describe the relation of two faces toward each other. They should not, therefore, be used in speaking of one face alone. Hence, it is not right to speak of a parallel face or of a perpendicular face, — the plural must always be used. In the past there has sometimes been a confusion in the use of the terms perpendicular and vertical. There should be a clear distinction between these terms; they are not synonymous.

Study also the edges of the square prism. The opposite edges are parallel to each other; the adjacent edges are perpendicular to each other. Notice then that a horizontal and a vertical edge are perpendicular to each other. Notice also that an edge may be perpendicular to another edge without being vertical. Tip the prism, and the same two edges remain perpendicular to each other, although neither horizontal nor vertical. Be careful, then, not to use the term *perpendicular* when you wish to speak simply of a vertical face, edge, or line.

Place the model vertical, with the top on a level with the eye. Lower it somewhat and observe the appearance of the top face; you see that the top face does not appear as wide from front to back as it does from left to right. You see also that the further edge does not look as long as the nearer one, and that the left and right edges appear to run toward it. Place the model horizontal from front to back, and observe it in the same way. Place the model horizontal from left to right, and observe it in the same way. Lead pupils to observe their models in the same way, but do not tell them what to see. Be sure to make clear to them, however, that this is the study of the appearance of the model, while the geometric views give the facts of its form.

**Objects like a Square Prism.** — The stems of some plants are somewhat like square prisms, but the form of a square prism is not common in Nature. Boxes and trunks are generally like a square prism, as its form is so well adapted to packing. Cars, omnibuses, and other vehicles frequently have the form of a square prism.

**To be developed.** — Parallel faces, perpendicular faces; parallel edges, perpendicular edges; parallel lines, perpendicular lines; seeing the facts, the appearance; objects like a square prism; drawing two views; quality of line.

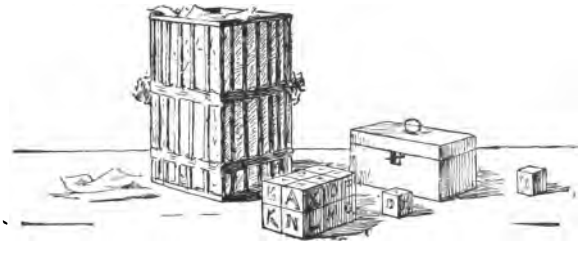
**Suggestions for Study of the Model by Pupils.** — How does this model compare with the cylinder? What kind of faces has it? (*Its faces are plane faces.*) What is the shape of the faces? (*Some are square, some oblong.*) Find tablets for the faces. How many square faces has it? how many oblong? What is it called? (*It is called a square prism.*) Move your fingers on opposite faces; what can you say of them? (*They are everywhere the same distance apart.*) What are such faces called? (*They are called parallel faces.*) Move your fingers toward each other on faces that are near each other; what can you say of those faces? (*They make a square corner.*) What are such faces called? (*They are called perpendicular faces.*) Can you find any parallel edges? any perpendicular edges?

How high is the model? how wide? What is the proportion of the width to the height? What is the shape of the front view of the vertical prism? (*The shape is an oblong.*) What is the shape of the top view? (*The shape is a square.*) Place the prism horizontal and observe it in a similar way as to its end and front views. Hold it vertical on a level with the eyes. Lower it a little. What is the appearance of the top face? Hold it horizontal from front to back. What is the appearance of the top face? Hold it horizontal from left to right. What is the appearance of the top face? Draw the top and front views of the vertical square prism on the blackboard.

**Drawing-Book, *page 7.* — Drawing two views of a Square Prism.**

**Observation Exercises by Pupils.** — What can you see in the room that is like a square prism? What can you think of that is like a square prism? For what purposes are things like a square prism used?

**Directions.** — The top view of a square prism is given. Below it, draw the front view, using the angle given, — first indefinite verticals, by vertical movement from the sides of the front view; then horizontals. (See page 88, for the illustration of Drawing-Book, page 7, completed.)



## EXERCISE V. — Oblong Tablet. — Five Views.

MODELS: ***Square and Oblong Tablets.***

**OBJECT. To study the oblong tablet; to draw its edge views.**

**The Oblong Tablet.** — In studying the square prism, two tablets were selected to show the shape of its faces, namely, the square tablet and the oblong tablet. The square tablet has already been studied. It has four sides and four right angles; the sides are equal in length. The oblong tablet also has four sides and four right angles; but only the opposite sides are equal. The figure called **an oblong** has the same characteristics as the oblong tablet. A distinction must be made, however, between *an oblong* and the adjective oblong. Oblong used as an adjective means simply longer one way than the other. An oblong means a figure having four sides and four right angles, its opposite sides only being equal. An oblong has two diameters — a long diameter and a short diameter — connecting the centres of opposite sides.

**Views of the Tablet.** — Hold the oblong tablet facing you; you have a face view of the tablet, which is an oblong having the same shape as the tablet. Hold the tablet so that you can see only an edge; you have an edge view which would be represented by a straight line. That line would be called the edge view of the tablet. If the tablet is held facing you, there will be four edge views, — the top, the bottom, the left, and the right. The top edge view should be placed directly above the upper side of the face view, the bottom directly below the lower side, the left directly at the left of the left side, and the right directly at the right of the right side.

**Quadrilaterals.** — The square and the oblong are called quadrilaterals, as they have four sides.

There are other quadrilaterals illustrated and described on the next page: the rhombus, the rhomboid, the trapezium, and the trapezoid. Faces having these shapes may be made by the combinations of solids, or they may be made by the division of solids. A clay cube may be bisected in several ways beside that mentioned on page 82. From the various bisections of the cube, solids having one face like one of these quadrilaterals may be produced. These figures and descriptions are introduced here for the teacher; if the children have had training in "The Use of Models," they may develop the rhombus and rhomboid by folding as described on the next page, and then study their characteristics. The rhombus and rhomboid are not very common figures. The rhombus is used in decorative work. The trapezium is so irregular a figure that it is usually the result of chance and not of design in objects. The trapezoid is seen occasionally in objects, as in the end of a desk or of that kind of a shed called a "lean-to."

A *rhombus*, Fig. 1, is a plane figure having four equal straight sides, and none of its angles right angles.

A *rhomboid*, Fig. 2, is a quadrilateral which has its opposite sides equal and parallel, but none of its angles right angles.

A *trapezium*, Fig. 3, is a quadrilateral which has none of its sides parallel.

A *trapezoid*, Fig. 4, is a quadrilateral which has only two of its sides parallel.

The differences and resemblances between the square and the rhombus will be noticed. Both figures have four equal sides; but all the angles of the square are right angles and therefore equal, while in the rhombus only the opposite angles are equal, and none of the angles are right angles.

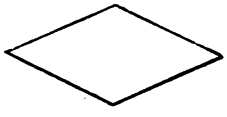


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

In comparing four of the quadrilateral figures described, namely, the square, oblong, rhombus, and rhomboid, we find certain features which are common to all four, while other features are common only to two.

Thus, all four have their opposite sides parallel and of equal length; but the square and rhombus alone have all four sides of equal length, while the oblong and rhomboid have only the opposite sides of equal length.

Again, the square and oblong have all four angles right angles; while the rhombus and rhomboid have only the opposite angles equal.

| The following diagram shows in which features any two of these four figures are similar, and in which they are dissimilar to each other:— | Those which have 4 equal sides are | Those which have only opposite sides equal are |
|---|---|---|
| Those which have 4 right angles are | SQUARE. | OBLONG. |
| Those which have only opposite angles equal are | RHOMBUS. | RHOMBOID. |

The quadrilaterals may be developed in an attractive way by folding. Folding should always be done with care and with a view to producing neat and attractive

results. It should always be done on the desk and never in the air; as the top of the desk is plane, it is an aid to accuracy. Take a sheet of paper; this is supposed to be of the ordinary shape, oblong. Place it on the desk, with the long edges from left to right. Place the left forefinger on the upper left corner, and fold the lower left corner up to meet the upper edge, so that the fold will start directly from the upper left corner. Do not crease the fold, but holding the paper with the corner turned up, lift the paper from the table, and crease it slightly just where the corner touches the upper edge. Unfold the paper and lay it on the table, with the long edges from front to back, placing what was the left edge before, at the back. Fold the paper over from front to back at the slight crease, being careful to make the left and right edges of the part turned up coincide with the left and right edges of the other part of the oblong. Crease and cut apart on the crease. You have a square and an oblong. See Fig. 5.

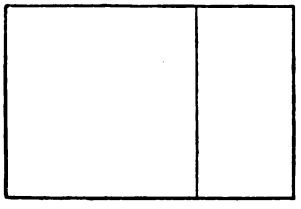


Fig. 5.

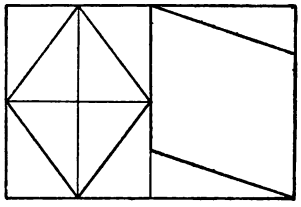


Fig. 6.

Take another sheet of paper. Place it on the desk with long edges from front to back. Fold the near edge over exactly to the far edge and crease. Unfold, and you have an oblong with its short diameter. Cut it on this diameter and you have two oblongs. Place one of these on the desk; fold first its short diameter, then its long diameter. Unfold; fold the lower left corner up so as to make a crease from the left end of the long diameter to the lower end of the short diameter; repeat with the lower right corner. Turn the paper around and repeat with the two other corners. Unfold and cut on the creases; you have a rhombus. See Fig. 6, left half. Place the other oblong on the desk, with long edges from front to back. Fold its short diameter. Unfold, keeping the oblong with its long edges from front to back. Fold the lower edge up to meet the short diameter; crease very slightly at the right end. Unfold, and turn the lower right corner up so as to make a fold, and crease from the lower left corner to the point just creased. Turn the other end of the oblong toward you and repeat. Cut on the creases. You have a rhomboid. See Fig. 6, right half.

Take another sheet of paper and divide into two oblongs as before. As the trapezium and trapezoid are irregular figures, they can easily be cut from the oblongs.

Of these six quadrilaterals, only the first three have important applications. It is interesting to know about the other three, but they are of minor importance.

**To be developed. — An oblong; face view, edge view; proportion; drawing the edge views; quality of line.**

**Suggestions for Study of the Model by Pupils.** — Cut an oblong. How many faces has this tablet that you have cut out? how many edges? Hold the tablet vertical and facing you; what is its shape? how high is it? how wide? What is the proportion of the height to the width? (*The proportion of the height to the width is* 2 *to* 1.) Hold it facing you with its long edges horizontal; how high is it? how wide? What is the proportion of the height to the width? (*The proportion of the height to the width is* 1 *to* 2.) Which sides are *parallel* to each other? which *perpendicular?*

Turn it backward until you see only the edge; what should be drawn for the edge view? (*A straight line should be drawn for the edge view.*) How long should the line be? Turn the end toward you; how long is the edge view? Can you draw on the board the face view of such a tablet, and its four edge views?

**Drawing-Book, *page 7.* — Drawing the edge views of an Oblong Tablet.**

**Colored Oblong.** — Cut an oblong of paper (orange if possible*) at home or at school, and paste it in the Drawing-Book to cover the printed oblong; *or*, mixing yellow and red, color the printed oblong orange.

**Drawing.** — The face view of an oblong tablet is printed, and points are given at which to begin the drawing of the top and left-edge views. Think of the top, bottom, left, and right-edge views and draw them.

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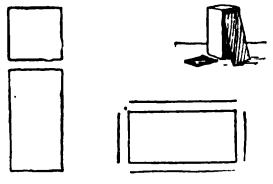
* If the pupils have learned the secondary colors, — orange, green, violet, — a tertiary, citrine, may be used here, or a tint of yellow may be used.



**Drawing-Book, page 7, completed.**

## EXERCISE VI. — Study of Natural Objects. — Blocking-in.

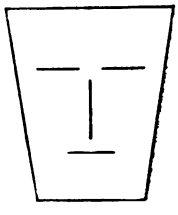
**MODEL.** ***Each Child brings a Potato, or some other vegetable.***

**OBJECT. To study a potato; to see its proportion and outline; to draw its outline by blocking-in.**

**The Potato.** — The value of any lesson depends largely upon its practicability. An admirable lesson in drawing from the natural object might be laid out theoretically on the bread fruit, but as the bread fruit is quite unattainable, such a lesson would hardly help here in drawing from the object. The potato has been chosen as the object to be studied in this exercise, because it is so universally used that it will be possible for every pupil to bring one as a model.

A potato is sometimes very nearly round or spheric; sometimes when not round it is almost symmetric, but it is more often oblong in form and most generally unsymmetric. If pupils have been trained in "The Use of Models," they will find its general resemblance to an ellipsoid. It would not be well to choose for a model a round potato, or one that was quite symmetric, neither would it be well to select one of abnormal irregularity. A talk with the pupils the day before the lesson, as to the usual form of the potato and a request that they should select one that looked like a very good potato to eat, will prevent specimens being brought which are exceptional instead of characteristic.

**Blocking-in.** — It often happens that in drawing the outline of an object, the mind is led away from the general directions of the outline, to some of the minute details. The details, however, are of much less importance than the general outline or the *mass* of the form; but in following the details, the general mass is frequently overlooked. If the mass and the general directions of the outline are studied, and these general directions are indicated by means of straight lines, the whole form is readily and truthfully given as to its general mass. This way of showing the general outline of an object is called in art-study blocking-in. It is a kind of rendering that seems almost instinctive. We all remember the childish drawings of heads with straight lines that give so much pleasure.



For the purpose of understanding just what is meant by blocking-in, study the potato in the manner indicated below for the pupils. This will enable you to see the proportion of the potato and the general shape of its outline. Draw the potato by blocking-in lines. You will find yourself very much attracted by blocking-in, after you have tried to express the outlines of a few objects in this way. Study the eyes carefully as to place and direction; indicate them only very slightly in the drawing. Then look at the further edge of the book on which the potato rests. The book should be

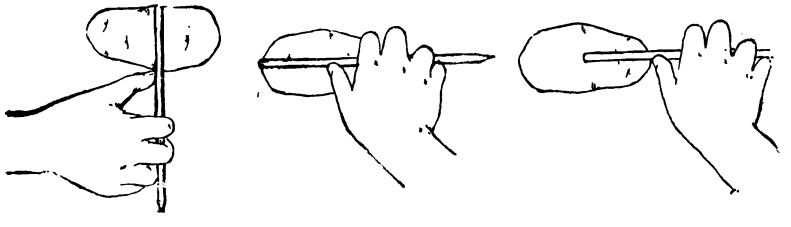
but a little below the level of the eye. The book serves as a table for the potato, therefore a line representing its further edge is called a ***table line.*** If the book is placed too far below the eye, the further edge will appear to be very high up behind the potato. A table line too high up does not produce a pleasing effect in the drawing. If, on the contrary, it is too low down, the object has the appearance of being too near the edge of the table, which is likewise not pleasant.

The blocking-in may at first look to you a little unfinished; but it must not be considered as an attempt at a finished drawing. The work upon this page of the Drawing-Book should stand as a sketch showing all the steps taken, — the means of approaching the representation, and working out the thought that is in the mind.

**Placing a Drawing.** — This is of great importance. In the previous exercises in this book, points have been given as guides in placing the drawings. In lessons from objects, it is not possible to determine any point, as the objects drawn are likely to vary in size and proportion. Pupils should be taught how to consider their space before beginning to draw, and how to plan the placing of their drawing. In this exercise there will be sufficient space to make a full-size drawing, that is, a drawing as large as the object.

The spaces above and below, at the left and at the right of a drawing, are called **margins.** Drawings should always be placed so that the left and right margins will be equal. The upper and lower margins may be made equal, but it is generally desirable to have the upper margin greater than the lower. This freer, broader space above is analogous to the expanse of sky and atmosphere above us, and like it gives an effect of freedom. The purpose of a margin is to separate the drawing from other things about it, and thus to give it an individual character. A margin of good width renders a drawing much more effective. It is well to remember this in framing pictures.

The word margin has different specific significations, but always refers in some way to the edge. The margin of a leaf is the edge. The margin of a printed page is the uncovered space between the printing and the edge of the page.



**Measurement.** — The proportion of the potato can be measured by comparing the height and width as illustrated.

**To be developed.** — **Proportion; blocking-in; table line; placing of drawing; margins.**

**Suggestions for Study of the Model by the Pupils.** — Place the object on a book. With the left hand, lift the book nearly to the level of the eye. With the right hand, measure the height of the object, on the pencil, placing the pencil against the object vertically. Hold the pencil with the point upward, so that the lower end seems just to cover the *lowest* part of the outline of the object, and move the thumb until it seems just to cover the *highest* part of the outline of the object. Compare this with the width. How do the distances compare? About how many inches is the object from top to bottom? from left to right?

Hold the object at arm's length on a level with the eyes and trace its outline with your finger on the object. Lay your pencil across the top; is the pencil horizontal or oblique? Lay your pencil on the sides; is the general direction vertical or oblique? This study will give the direction of the **blocking-in** lines.

How far up on the potato does the further edge of the book appear to be? When you have drawn the potato, represent the further edge of the book by a line each side of the potato, thus drawing what is called the table line.

**Drawing-Book, *page 8.*** — **Blocking-in the Outlines.**

**Study of Margins by the Pupils.** — Open your reader; what is the space around the printing called? (*The space around the printing is called the margin.*) Find other margins. You are to make a drawing on page 8, full size of the object, if you can do so and leave sufficient margin. On a page of the size of page 8 how much margin should you allow? (*Usually not less than an inch should be allowed.*) How should the left and right margins compare in width? (*They should be equal.*) If in a drawing the top and bottom margins are made unequal, which should be the wider? (*The top margin should be the wider.*)

The illustrations show the stages of drawing, Figs. 1, 2, and 3.

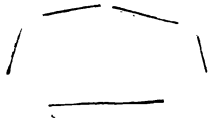


Fig. 1

Fig. 2

Fig. 3.

**Directions.** — Make a large drawing on this page, full size of the object if possible. Draw light, indefinite lines to show the height and width, studying the object carefully for the general proportion and for the direction of the blocking-in lines for the first stage. Add other straight lines necessary to complete the blocking-in. If your first line does not seem quite right, add another without erasing the first. Draw the curves over the straight lines. Add details, but not too many, and the table line. *No erasing.*

## EXERCISE VII.—Natural Form.

**MODEL:** ***Each Child brings a Potato, or some other small vegetable, or the Teacher provides a larger vegetable.***

**OBJECT. To study a natural form; to see its proportion and outline; to draw its outline.**

**The Potato.** — Added interest may be given to this lesson by telling how great a traveler the potato has been. The Spaniards discovered its use by the natives near Quito. It grows in the temperate zones; and it was cultivated, at the time of the discovery of America, in all the temperate part of South America. In 1586 the colonists sent out to North Carolina and Virginia by Sir Walter Raleigh returned to Ireland and took with them some American potatoes, which were at once planted and cultivated on the estate of Sir Walter, near Cork. In this way potatoes were introduced into Ireland.

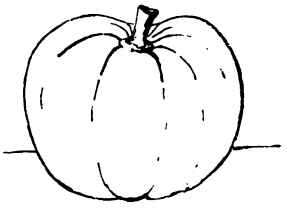
There are many varieties of potatoes, which are divided in a broad way into four classes: rounded forms, which are nearly round; long forms, or "kidneys;" "lap-stones," which are more or less flattened; and "pebbles," which are broader at one end than at the other. The potatoes brought may be classified according to this division, and thus the pupils will be brought in a new way to notice the forms.

A great many of the pupils will have no idea of the way in which potatoes grow. They will be glad to hear how the long stems run underground and swell out now and then into what is called a tuber. This tuber is the potato. Potato plants are cultivated by hoeing the earth up over the roots and underground stems until a little hill is formed. When the potatoes are ripe, the hills are opened with a hoe, and the potatoes, which are then a light golden-brown, gleam in the dark earth. The potato plant has a very pretty flower which ripens into a ball or berry.

**The Squash.** — If the potato was drawn fairly well in the preceding exercise, something else from the garden may be given for this exercise. A squash has quite a distinctive but not a difficult form. Those who have studied "The Use of Models" will see that the squash and the potato are based on the ellipsoid. Two or three squashes will be sufficient for a class. If only one should be used, those pupils sitting at the side would not see it in its simplest aspect, as they would see it obliquely.

The outline of the squash cannot be seen with equal distinctness in every part. Therefore it should not be drawn with equal distinctness in every part. The squash has ribs; in the drawing these should be marked only lightly, and should occasionally be broken, as they are not of equal depth throughout. They should not be drawn so distinctly that the first impression given by the drawing will be that of ribs. The first thought awakened by the drawing should be that of a squash. If the ribs or any details are made too prominent, they will detract from the thought of the object as a whole. Do not tell these things to the children, but endeavor to lead them to tell you.

**The Pumpkin.** — This also would be a good subject. You can read to the children Whittier's poem, "The Huskers," from which the verse below is taken, or another poem of his, "The Pumpkin." If they cannot understand them all, they will take their gentle, bright spirit, and will study and draw the pumpkin with a new delight.



In studying any of these objects, it may be well to see if the pupils discover the difference in appearance between the side that is in light and the side that is in shade. If they do discover for themselves this difference, they may express it, when they finish their drawings, by making the outlines and any markings upon the side that is in shade somewhat darker than the side that is in light. As the pumpkin is nearly alike on all sides, one would be sufficient as a model for the class.

> "Bent low, by autumn's wind and rain, through husks that, dry and sere,
> Unfolded from their ripened charge, shone out the yellow ear;
> Beneath, the turnip lay concealed, in many a verdant fold,
> And glistened in the slanting light the pumpkin's sphere of gold."

**Quality of Line.** — As the surface of any of these vegetables is very different from that of the solids, their outline should be represented by a line of a different character. The solids are smooth and regular, and their outline should be represented by an even line. The vegetables are irregular, and their outlines should be represented by lines varying in thickness and perhaps sometimes broken.

**Language Lessons.** — A teacher will see at once the opportunity here afforded for a good language lesson, which may be illustrated. Free illustrative drawing should be encouraged in every way. If any boy can write a description of making a jack-o-lantern out of a pumpkin, and illustrate it, the effort will doubtless prove a creditable one, for his heart will be in the work.

A geography lesson with regard to the vegetables of the temperate zone might be a pleasant exercise.

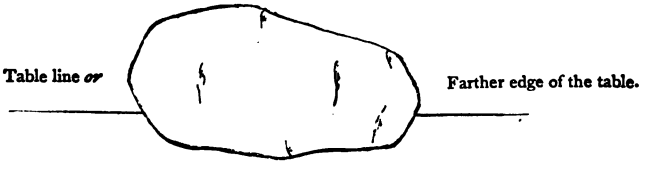
**To be developed.** — Characteristics of object; varying and broken lines; details should not be prominent; pleasant thoughts; drawing outlines; character of line.

**Suggestions for Study of the Object by the Pupils.** — (Whatever object is chosen, the pupils should be led to discover its characteristics of form by studying it as the potato was studied in the preceding exercise.)

**Drawing-Book, *page 9.* — Drawing the Outlines.**

**Study of Details by Pupils.** — What is Fig. 1, on page 9? Fig. 2? What details do you notice in Fig. 1? (*I notice the eyes of the potato.*) And what do you notice in Fig. 2? (*I notice the stem and the elongated end.*)

Pass your fingers over the surface of your object, over a rounded part of your desk; what difference in the surface do you notice? (*One is smooth and even or regular, the other irregular.*) Compare the lines in the illustrations on this page with those on page 4 what difference do you notice?




**Directions.** — Make a large drawing on this page, full size of the object if possible. Draw light, indefinite lines to show the height and width, studying the object carefully for the general proportion and for the direction of the blocking-in lines for the first stage. Add other straight lines necessary to complete the blocking-in. Draw the curves over the straight lines. Add details and the table line. Finish in broad, soft, gray lines, breaking the outlines somewhat to indicate irregularity of surface. In finishing the details, make them lighter than the outline and leave them rather indefinite, making one or two of the nearer ones a little more defined than the rest.

## EXERCISE VIII. — Tumblers. — Study of Proportions.

MODELS. ***The Teacher should have two Tumblers of different proportions.***

**OBJECT. To lead pupils to think of proportion as a pleasing element of form; to show it by drawing the front views of tumblers of pleasing proportions.**

**Tumblers.** — This exercise is given as a first step in what is called constructive design, that is, designing the form of objects. In all successful teaching, the pupils' interest must be gained. This can best be done by bringing up something connected with their enjoyments. At this stage their enjoyments have a comparatively limited range, the higher and deeper mental and spiritual enjoyments not being yet within their powers.

If you wish a pupil to think of the pleasing form and proportion of a tumbler, lead him first to think of something good in a tumbler, — of the pleasant uses that are made of tumblers. By thus referring to something which he has already pleasantly experienced, you will get not only his thought, but also his interested and intelligent thought in a way quite different from that which you would have if you proceeded at once to examine a tumbler with him, and to consider the proportion of height to width. In all your teaching, study the child. The child is of greater importance than the subject-matter which you are teaching.

If you will notice tumblers, you will see that there is a great difference not only in delicacy of material, but also in proportion. You say of one, "Ah, it would be pleasant to drink from that tumbler!" Perhaps you do not think why; but it is not only because it is of delicate material, and therefore pleasant to the lips, but it is also because its form and proportion are well adapted to its purpose. Observe tumblers; they are of various forms. Some are of equal width all the way down, called "straight," or "ship-shape;" some are the widest at the top, called "flares;" and occasionally some are the widest a little below the top, called "cups;" but none are the widest at the bottom. In early times drinking-glasses were made with rounding bottoms, so that a person who began to drink must finish or hold his glass. If the glass were set down, it would tumble; hence it was called a tumbler. We frequently find vases widest at the bottom; can you tell why tumblers are not made so? Notice the general proportion of width to height, and how this proportion varies in the different forms. The usual proportion of width to height in "straight" tumblers is 2 to 3. In "flares" the usual proportion of the width at the top to the height is as 3 to 4.

If you find tumblers varying much from these proportions, try drinking from them, so as to learn from which it is most pleasant to drink. After you have made such a trial, you will find that the tumbler will be the most pleasing in form to your eye from which you found it the most pleasant to drink. Try to drink from a tumbler of equal

width all the way down, that is also very tall in proportion to its width, and you will find the rim is very much in the way as you tip the glass up to drink the last drop; try a tumbler that is very low for its width, and you will find the water spilling easily. There is a subtile connection between the pleasures of the eye and the fitness of things. If you wish to draw a tumbler of pleasing proportion, you must first consider what proportions are the best for drinking purposes, and for the particular drinking purposes for which it is best to be used. A lemonade-glass may well be of different proportion from that of a water-glass. Putting this in a general way, the conclusion would be that, in designing the form of an object, the first consideration must be the use to which it is to be put. Then, while bearing that in mind, consider also whether the form could be in any way modified so as to be made more beautiful.

Tumblers, and similar articles in common use, have been experimented on so much with regard to suitable form, that the best general form has been already reached. There is not, therefore, in this exercise, a great opportunity for originality. In working out this exercise do not try to invent a form different from anything ever seen before; rather try to express your ideas of tumblers pleasing in form. The tumblers which you have for the class are to be used only during the class discussion of the form of tumblers. They should be put away when the drawing begins, as the drawing in this case is to be from memory and imagination combined, and not from models.

**Front View.** — The illustrations given for this exercise in the Drawing-Book are simply to aid the pupils' thought, and not as copies. They represent the appearance of two tumblers below the eye, Fig. 1 showing a tumbler partly filled. The *front view* of a tumbler of the same width all the way down is called for on the left half of the page; the *front view* of a tumbler, the widest at the top, is called for on the right half of the page. These drawings are to represent the pupils' ideas of pleasing proportion, and are therefore not expected to be copies.

**Study of the Appearance.** — It will not be out of place here, or in any other exercise which concerns geometric views of an object, to give a little time to the study of the appearance of the same object either above or below the eye. If a study of the appearance of a model or object were always given in connection with the study of its facts of form, the pupils would gain clear ideas of the facts and of the appearance, and of the difference between the two by contrast with each other. They would thus learn to see the appearance as readily as they now see the facts. If the teacher prefers, and can give the pupils tumblers so that they can study the appearance from a tumbler, the drawing at the left may be the front view of a tumbler giving the pupils' idea of a tumbler pleasing in proportion, and that at the right may be the appearance of the tumbler below the eye. In many schools the pupils keep on their desks small mugs or tumblers for water for their sponges. These might serve as models from which to study the appearance.

**To be developed.** — Elementary constructive design; form of tumbler suited to purpose; good proportion; drawing the front views.

**Suggestion for Observation by Pupils of Form as suited to Purpose.** — What do you like to drink? From what do you drink? Are tin drinking-cups usually higher than they are wide, or wider than they are high? How is it with tumblers? How do you take hold of a tumbler when you drink? of a tin cup?

Can you think of a tumbler of the same width all the way down? What is the direction of its sides? (*Its sides are vertical.*) Of what model does it make you think? (*It makes me think of a cylinder.*) What would you draw for the front view of a cylinder? Can you draw upon the board the front view of a tumbler that is the same width all the way down, and make it of good proportion, that is, so that it will look well, and so that you think it would be convenient to drink from?

(The teacher develops the idea of a tumbler widest at the top in a similar way.)

**Drawing-Book, *page 10.*** — **Drawing the front views.**

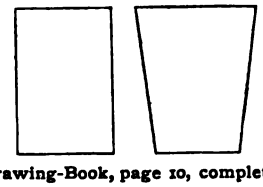
**Observation Exercises for Pupils.** — What is Fig. 1? (*Fig. 1 is a picture of a tumbler.*) What do you notice about the tumbler? (*It is of the same width all the way down; it is half full of water; there is a table line.*) How should you place a tumbler so that it would look like that in the picture? (*I should place it somewhat below the eye.*) Why do you think the tumbler from which the picture was made was placed below the eye? (*I think it was placed below the eye because it looks as though you could see into it at the top, and because it curves downward at the bottom; a tumbler always appears to curve downward at the bottom when it is below the eye.*) How would you place the tumbler for the front view?

What is Fig. 2? (*Fig. 2 is a picture of another kind of tumbler.*) What do you notice about this tumbler? (*It is wider at the top than at the bottom; it has plane faces at the bottom of its curved face; there is a table line; the plane faces look narrower at the left and right than in the middle; it looks as though you could see into it.*)

The plane faces having a curved edge at the top are called "flutes." If you should draw a tumbler that looked like this, as if you could see into it, what would you say you had drawn? (*I should say I had drawn the tumbler as it appeared, — the appearance of the tumbler.*)

**Directions.** — Two drawings of front views of tumblers are to be made on this page. Draw an indefinite vertical centre line for each. On the left centre line draw the front view of a tumbler with vertical sides, making the drawing of the size and proportion that you think pleasing and suitable for a tumbler of the kind.

On the right centre line make a drawing of a tumbler wider at the top than at the bottom, of suitable and pleasing proportion.



**Drawing-Book, page 10, completed.**

If the teacher prefers, on the right centre line make a drawing of the appearance of a tumbler.

## EXERCISE IX. — Study of an Envelope. — Two Views.

MODEL: *Envelope.*

**OBJECT. To study an object based on an oblong; to determine its proportion; to draw two views.**

**The Envelope.** — This is an object of comparatively modern use. Fifty years ago it was hardly known. Letters were written on the large sheets of paper, known as letter size. As postage was expensive in those days, — eighteen pence, or one shilling and six pence, New York currency (eighteen and three-quarter cents), for a letter, — it was necessary to write as much as possible in one letter, for but few could afford to send a letter very often.

The first, second, and third pages were written upon, and the upper and lower parts only of the last page, for the middle half was reserved to make the outside of the letter when folded. Folding a letter then was quite a different matter from folding a letter now to put into an envelope. After the letter was written, it was placed upon the table with the first page in sight. Both pages were taken together at the bottom and folded up, so that the lower edge reached to the middle of the sheet, making a horizontal fold, which was creased firmly. The sheet was then turned around so that the top became the bottom, and that part was folded over to the middle, making another horizontal fold. The folded sheet was now turned so that what was originally the left edge was toward the writer. That part was folded over toward the back so as to make a well-proportioned oblong. This oblong was folded over again, and the doubled edges of the first oblong were slipped in between the double edges of the last oblong. If you try to carry out this folding with a sheet of paper, you will understand the different steps. The letter was then sealed with sealing-wax or with a wafer. The wafer was a very thin circular disk made of some material which adhered when moistened. The wafer was moistened and placed between the outer fold and the body of the letter to hold it together. Later, the fashion came of folding the corners of the last oblong so as to produce a pointed flap something like that of an envelope. After a time, some one thought that the whole letter sheet might be used for writing, and a blank piece of paper put around it to keep it in good order and to secure its contents from being read. Gradually the envelope took its present form with its gummed flap.

Envelopes have now a much wider use than for letters only; they are used for circulars, for documents, for samples of goods, for various small articles of merchandise and manufacture. They are consequently made of various materials, in various forms, and with various fastenings. The material used varies from the thinnest packet-

post paper to heavy manila cardboard and cloth-lined paper, where great wear is expected. Envelopes are generally flat, but some envelopes for documents, photographs, etc., are made like an oblong section of a square prism. The gummed flap is the usual way of fastening, though sealing-wax is still used by many. There are also other methods of fastening, one of which is illustrated on page 81. A grommet (a brass fastener) is frequently used, while envelopes for documents are provided with eyelets and tape. The plain side of the envelope is called the front, or "face," of the envelope; the other side is called the back, or "seal side." This exercise furnishes the foundation for quite a variety of manual work.

**Judgment of Proportion.** — As has been said, the proportion of an object becomes more beautiful as it becomes more subtile. The more subtile proportions cannot be expressed in whole numbers, and it is not well to try to express proportion by the use of fractional numbers. They can be expressed, it is true, with the closest mathematical accuracy, but this is not to be desired. In studying for the exact mathematical expression, the attention is directed to that point to such a degree that the feeling for the whole form or figure is frequently quite lost. An approximate statement in whole numbers of the proportion of any figure is much better than an elaborate statement in fractional numbers. Some room may be left for the exercise of the judgment.

**Drill.** — As pupils have not had any drill upon straight lines since the first part of the book, an exercise is given here to prepare them for the oblique lines of the envelope. A drill exercise should be short; it should not occupy ten minutes.

**To be developed. — Making the model; judgment of proportion; semi-diameter; drawing oblique lines; size of drawings; drawing the envelope; quality of line.**

**Prang's Pattern Sheet, No. 4. — Making the Model by Pupils.**

What is printed on this sheet? Cut out the printed pattern; fold and paste to make an envelope.

**Suggestions for Study of the Model by Pupils.** — What is an envelope for? For what would your envelope be used? Hold your envelope vertical, the plain front side facing you; what is its shape? (*Its shape is oblong.*) What is its size? (*It is four inches and a half high, two and a half wide, — four and a half by two and a half.*) Its proportion? (*About 4 to 2; we cannot tell exactly.*) How can you draw the envelope of the right proportion? (*By judgment; we know that the drawing should be a little more than half as wide as high; we shall have to judge the rest.*)

Turn your envelope so that the lapped side, the back, will face you as in Fig. 2, page 12. Where is the point of the flap? (*The point of the flap is about in the middle of the oblong.*) If you should draw a horizontal through the middle of the oblong, what would you call that line? (*I would call it the horizontal diameter of the oblong.*) Where

would the oblique laps that start in the right-hand corners meet? (*The laps would meet on the horizontal diameter.*) Draw the horizontal diameter of Fig. 2; trisect the left half-diameter; note that the oblique edges, if continued, would meet at about the second point of trisection. (The teacher gives the term **semidiameter**.)

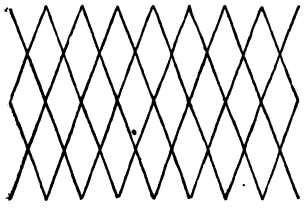
What kind of corners has the envelope? (*It has square corners.*) What kind of angles do you find in square corners? (*I find right angles in square corners.*) What other angles do you find in the back of the envelope? (*I find acute angles made by the edges of the flap and the edges of the envelope; I find obtuse angles at the points of the upper and the lower flaps.*

**Drawing-Book, *page 12.*— Two views of an Envelope.**

**Observation Exercises for Pupils.** — What is Fig. 1? What is Fig. 2? If you wished to make a drawing of each of these figures on the page, but wished to make them as large as the page would allow, leaving good margins, how large would you make them?

**Drawing-Book, *page 11.*— Drill Exercise. — Oblique Lines. Practice Page for Exercise IX.**

**Practice.** — Bisect the distance between *b* and *c*; mark it *f*; bisect the distance between 8 and the point directly below it; mark the point 9.



Draw an oblique line from 1 to *f*; draw lines parallel to this from 3, 4, 5, 6, 7, 8, 9, to *e* and the successive points at the bottom of the page.

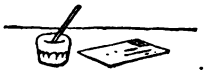
Draw an oblique line from *f* to the second point at the bottom of the page; draw lines parallel to this from 0, 1, 2, 3, 4, 5, 6, to the successive points at the bottom of the page and from 7 to 9.

Practice movement for each line before drawing. Draw with arm movement. The object is to secure free movement.

**Directions, page 12.** — Required on this page two drawings of a vertical envelope, — one of the front, the other of the back.

FRONT. — Two angles are given at the right of Figs. 1 and 2. Draw a vertical connecting the lines. This vertical is for the left edge of the envelope. Determine the width necessary for a drawing that will have the proportion of the model, and draw the vertical for the right edge. Draw the horizontals.

BACK. — One angle is given. Draw an oblong as for the front. Draw its diameter. Trisect the semidiameters. Draw the oblique lines, noting whether they are straight from the corner or whether they are curved or bent.



## EXERCISE X. — Envelope.

MODEL: *Envelope.*

**OBJECT. To study a familiar object based on an oblong; to determine its proportion; to draw its outlines.**

**The Model.** — It would be well to use an envelope for this exercise differing somewhat from that used in the previous exercise. This model would doubtless differ somewhat in proportion, thus giving new practice in the judgment of proportion. It would present the leading points of the previous exercise in a different way.

Before drawing the envelope, a little time may be given to the proper way of writing an address on a letter.

**Making Envelopes.** — Having made the envelope as a model for the previous exercises, pupils will be interested to know something of the way in which envelopes are made. A machine first cuts out the blanks (the envelopes before they are folded) in the proper shape. Another machine folds the blanks, gums the bottom flap, and presses it on the side flaps. It then gums the top flap, dries the gum, folds the flap, counts the completed envelopes into bundles of twenty-five, delivers them from the machine, and records the whole number of envelopes delivered. It seems almost human, for it expresses in such a wonderful way the thought and will of the inventor. A machine is, as it were, thought and mental power materialized.

**Shapes of Envelopes.** — The illustrations show the most common shapes of envelopes. They can be drawn upon the board and pupils questioned, without

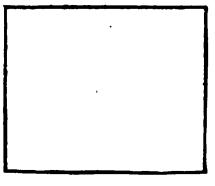


Fig. 1.

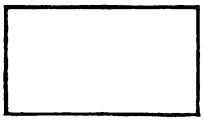


Fig. 2.

Fig. 3.

attempt to influence their choice as to which is the most pleasing shape. This will serve as an exercise in experimental æsthetics, for learning the most pleasing proportion. By collating the results obtained in large numbers of classes, the average preference can be obtained. For this reason the authors will regard it as a favor, if teachers will record the number of pupils in a class preferring each shape, and send the record to

"The authors of Prang's Complete Course," 7 Park Street, Boston, Mass.

**To be developed.** — Shape, proportion; purpose of envelope; drawing the envelope; character of line.

**Suggestions for Study of the Model by Pupils.** — How would you send your envelope? For whom is it intended? What would you do to have it reach him? How would you write the address? Here is an oblong on the board, which represents an envelope. Come and write your full address in it. Draw the postage-stamp in the corner. What kind of edges has the stamp? Do not make the drawing of the stamp as strong as the lines of the envelope. Make them rather faint and broken.

What is the proportion of your envelope? Look at the back of it. How much does the top flap overlap the bottom flap? Are the edges of the top and bottom flaps straight or curved, or have they angles?

**Drawing-Book, *page 13.*** — **Drawing an Envelope.**

**Observation Exercises for Pupils.** — What is Fig. 1? What do the broken horizontals represent? (*They represent the address.*) What is the special purpose of each line of the address? What is the vertical oblong in the corner? What is the actual size of a postage-stamp? Why is it not made of that size in Fig. 1? On what part of an envelope should the postage-stamp be placed? Why?

What is Fig. 2? If you were going to draw such a figure, what line would you draw to help you in placing the point of the flap and the point of the lower part that is turned up? (*I would draw a vertical as a centre line.*)

Write your name and address on the envelope that you use as a model.

**Drawing.** — Two short printed horizontals show the height of the envelope. Beginning near the left margin of the page, draw two indefinite horizontals through the short horizontals. Determine the width necessary to make the drawing of the same proportion as the envelope you have for a model. Draw the left and right verticals. Finish now either as a front view as in Fig. 1, or as a back view as in Fig. 2. If the former is chosen, write your name and address on it. If the latter is chosen, draw an indefinite vertical downward through the points, beginning just below the title of the exercise, for the centre line of the drawing. Place points on this line where the oblique lines meet it and draw the flaps.

## EXERCISE XI. — Fan, from the Object.

MODEL: *A Fan.*

**OBJECT. To study the form of an object based on a circle; to see and to draw its outlines.**

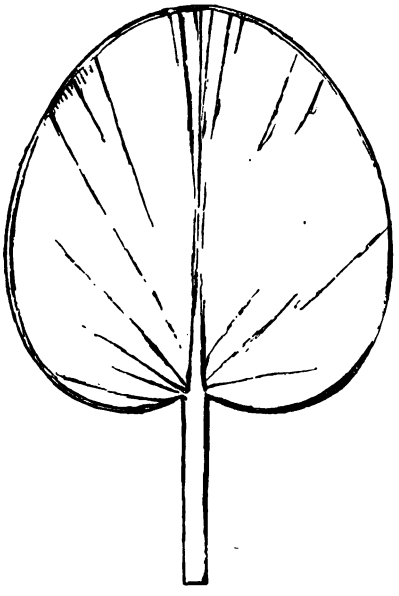
**The Fan.** — In hot weather a movement of the air, a breeze or a wind, gives great pleasure, bringing coolness and refreshment. Fans have been devised to make an artificial breeze. In making a fan, it is necessary to think of two things, — the amount of breeze that can be made, and the exertion necessary to make the breeze. The larger the amount of air that can be set in motion, taken in connection with the force moving it, the more breeze there is. An object that can present a broad face to the air will make more of a breeze than one presenting a narrow face; therefore a broad face is given to a fan. But the exertion required to move the fan in the air has to be taken into account. An exertion that would not be thought great for one motion becomes considerable when repeated so as to make a continuous breeze. Every movement that is made increases the heat of the person making it; so that if the exertion necessary to move the fan is considerable, the heat engendered by that effort counterbalances the coolness given by the breeze, and the fan is not of much use. Therefore fans are made as thin as possible, so as to give a broad expanse with a light weight. Pupils can be led to these statements by skilful questions guiding their thought; thus they will have another example of the form of an object suited to its purpose. This is an extremely important point in constructive design, which will be taken up later. Hence every opportunity should be used to impress the necessity of considering the purpose of an object in designing its form.

Fans come largely from India and Japan. Our best fans for practical purposes are palmleaf fans from India. The Japanese have become so skilful in the manufacture of thin and light, but tough, paper, that their fans covered with this paper are excellent. Fans that fold were devised, so that they could be easily carried when not in use. Fans afford very good opportunities for decoration. Watteau, a French artist, became celebrated for his pictures on fans; and the possessor of a Watteau fan is considered extremely fortunate.

**Movement.** — Fans are used with three movements, — the wrist movement, the elbow movement, and the shoulder movement. The wrist movement is used when the person fanning wishes to make but slight exertion, or wishes to make a breeze for himself only, which many times it is a matter of courtesy to do, as the person sitting next may not desire the breeze. The elbow movement is used when a greater breeze is desired, and also when the breeze is intended as a refreshment to others. The shoulder movement is used when the fan is needed to brush away the flies, or give a cooling breeze at a sick-bed. It will be a good exercise for the pupils to practice the wrist movement, the arm movement, and the shoulder move-

ment, using both hands as fans. The pupils will be delighted, and will at the same time be bringing the muscles into that free state which is so necessary in order to have them act as servants of the mind. The mind itself will be brought into a receptive state through the enjoyment and stimulus of the pleasurable exercise.

**Selection.** — The illustration in the Drawing-Book is not given as a copy, only as a suggestion. A very simple kind of fan should be chosen for this exercise. If a palmleaf fan should be selected, three fans will serve for the whole class. These may be placed against the blackboard back of the teacher's platform. This will give a good opportunity for the pupils to study the mass rather than the details. If you have a palmleaf fan in your hand, you can easily trace nearly every rib all the way to the stem. Place it on the opposite wall of the room, and you will find that only very rarely you can see a rib thoughout its entire length, but that here and there you can see a part of the rib. If the fans that are used as models are placed some distance away, pupils can be led to see that the ribs are not apparent in some places; they can also be led to see that they will not be telling the truth about the appearance, if they draw what they do not see. They can also be led to see that the whole fan is more important than the ribs, and that if they draw the ribs so strong and definite that they seem more important than the fan, they will not be representing the fan fairly or truly. These are steps toward true art feeling.



The study of the fan which is given below is based on a fan like the one in the Drawing-Book. It suggests the general method which might be pursued in the study of any fan. Before giving it, make some experiments with regard to the appearance of the fan. Hold the fan facing you; you have a front view. Keeping the fan vertical, turn the face away until you see only the edge; you have an edge view. Still keeping the fan vertical, turn the face toward the left, about half-way back toward the position in which you first held it; you see the appearance of the face of the fan, and the apparent width is half-way between the width of the face in the front view and its width in the edge view. Hold the fan so as to get an edge view again; turn it half-way toward the right, and observe the appearance. You can lead the pupils to see the appearance also, the Drawings-Books being held up as fans.

**Drill.** — A drill exercise is given on circles as a preparation for drawing the fan. Let the aim be quick and ready drawing. Therefore do not spend ten minutes on the drill. Lead the pupils to think of the drill exercise as a trial of skill and readiness.

**To be developed.** — **Shape of fan; axis; trisection; arc; details not prominent; drawing the fan; character of line.**

**Suggestions for Study of the Fan by Pupils.** — Follow with your finger the shape of the fan; what is the shape like? (*The shape is somewhat like a circle.*) Trace the shape again in the air; where is it not like a circle? What is the form of the handle? Point to the centre of the fan; compare these distances, — from the top to the centre, from the centre to the upper end of the handle, from the upper end of the handle to the lower end.

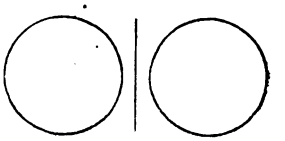
Point to the middle of the top of the fan, and then move your finger straight down to the bottom of the handle. Suppose such a line were drawn on the fan, how would it divide the fan? (*It would divide the fan into two equal parts.*) What is such an imaginary line called? (*It is called the axis of the fan.*) If you wished to divide the axis into three equal parts, what would you do? (*I would trisect it.*) How would you trisect it? See page 36.

**Drawing-Book, *page 15*. — Drawing the outline of the Fan.**

**Observation Exercises for Pupils.** — What are Figs. 1, 2, 3? In Fig. 3, which is the axis? There is a curve across the lower part of the circle in Fig. 3; what kind of a curve is it? (*It is a curve from a circle, — circular.*) Any part of a curve is called an **arc**. How is the point where this arc crosses the axis found? (*It is found by trisecting the middle third of the axis.*) How are the places found for the ribs of the frame? What is the character of the line in the arc and the ribs?

**Drawing-Book, *page 14*. — Drill Exercise. Practice Page for Exercise VI.**

**Practice.** — Look at page 11. How far is it from *a* to *b*? Quadrisect the distance from *a* to *b*. How far is it from o to the first point below *a*? Turn to page 14. Bisect the upper edge; an inch and a quarter below the point of bisection make a short vertical mark. From this vertical draw, at the count of the teacher, a vertical down the page, stopping an inch from the lower edge, first practicing movement. In the left-hand space, beginning at 1, and moving in the direction 1, 2, 3, 4, 1, 2, etc. (see page xiv), practice the movement for a circle as large as the space will allow, then draw a circle with one sweep; repeat in the other space. Pay special attention to pencil-holding. *No erasing.*



Drawing-Book, p. 14, completed.

**Directions, page 15.** — Connect points given by a vertical. Mark the upper end 1. Trisect the vertical and mark the points of trisection 2, 3. Use the part of the vertical from 1 to 3 as a vertical diameter for a circle. Draw a circle on this diameter, practicing the movement first. In the upper part of the circle draw the curve for the upper part of the fan. Draw the handle. Add other details. Finish in soft gray lines, noticing the character of the lines in Fig. 1. Strive to make the drawing like the fan which is presented as an object.

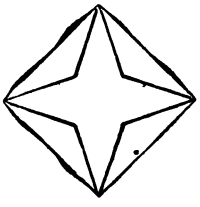
## EXERCISE XII. — Modification of Units.

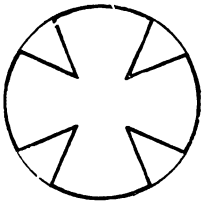
**OBJECT. To study a unit and ways of modifying it.**

**Growth of Ornament.** — If you look around, you will see very few articles that are not in some way ornamented. It may be simply by a border, as a border of a handkerchief; it may be that the surface is covered with ornament, as a carpet or wall-paper or dress-goods; or it may be by a single ornament, as a rosette for some particular place.

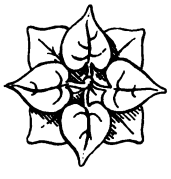
There is some doubt as to which of the first two, a border or a surface covering, was the earliest in the history of the race. In pottery decoration, doubtless, borders were the first. Weaving furnishes the starting-point for surface covering. Both pottery and textile fabrics are found among early and primitive people; it is hardly possible to decide which was first in point of time.

However that may be, it would seem that the borders on pottery suggested the use of borders on other things, and the varied surface produced by the weaving suggested ornamenting the surface of other things. Borders in pottery were evidently produced first by the use of lines, first separate and then connected, and then of very simple figures, as squares, circles, oblongs, etc. Surface covering was in the weaving at first a simple alternation of squares of different colors. These were doubtless also the first borders and surface covering used for other things.

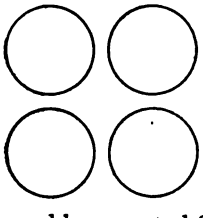


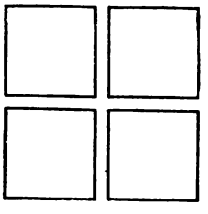


Gradually some modifications of the squares and circles were made. The squares became perhaps stars, and the circles perhaps became a very primitive quatrefoil or cross. Later such figures as the quatrefoil and Greek cross in Book I. developed.



Then, perhaps through the influence — though possibly quite unacknowledged — of Nature, of the leaves around the stems and of the petals of a flower around its centre, there came the idea of a rosette, — of arranging figures around a centre. Simple clusters of circles or squares like these perhaps were made, and proved unsatisfactory because they seemed so separated until a figure was added in the centre to hold them together.





Arrangements of such figures, strengthened by a central figure, are frequently found in decorative design.

The influence of Nature was constantly at work, and the straight-line figures took on a little the shape of leaves, — the rhombus, Fig. 1, like a leaf widest in the middle, and the kite-shaped figure, Fig. 2, like a leaf widest a little above the middle. Indian arrowheads show a variety tending to this form. They were made, of course, for the purpose of cleaving the air, as well as giving weight and power to the arrow; but there seems to be in them also some idea of beauty of form and of its development; and this work may be accepted as throwing some light on early decoration.

Fig. 1.

Fig. 2.

While such forms as these were being developed, doubtless the new units were repeated around a centre like the petals of a flower. The rhombus served admirably for six repeats, either close, Fig. 3, or separated, Fig. 4; but gradually the kite-shaped figure was developed, and it still remains as the most universal unit used for repetition around a centre. It undergoes many modifications, but through them all its main characteristics remain, namely, proportion and the consequent unequal tapering at the two ends of the axis.

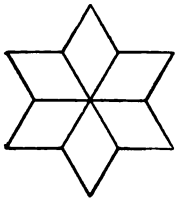


Fig. 3.

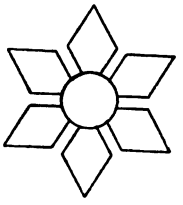
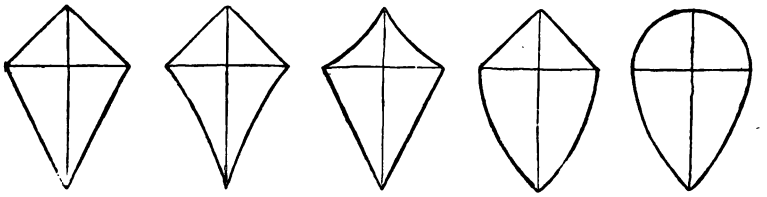


Fig. 4.

Illustrations of these figures and arrangements mentioned may be found in the leading works on decoration. Repeated examples of squares, circles, etc., in borders as well as in surface decoration occur. Racinet, in his "Polychromatic Ornament," gives an example of textile fabric, very fine in color, from Central Africa, in which quatrefoils appear as the unit in a surface covering. In the same plate, stars and crosslets, as well as top views of flowers and conventionalized branches of leaves, are found.

**Decorative Design.** — In the exercises in this Course the effort has been to follow the natural development of ornament by simple steps. Exercises for the arrangements of straight lines, circles, and squares as borders have already been given; and the foundation for a surface covering of circles in squares has been laid in the exercises for page 6, Book I., and pages 2 and 14, Book II. Looking at Fig. 1, Drawing-Book, page 17, a rosette is found made by the repetition of kite-shaped units around a centre within a quatrefoil. On that page the pupils will make arrangements of their own in a quatrefoil by the use of modified units. In order to do this, pupils should first have an exercise in the modification of units. The kite-shaped unit is therefore given them first to draw, and then they are to make a simple modification of it. The proportion of this unit is as 2 to 3, the second proportion in the series given on page 79. Lead them to make only a slight modification of the unit by changing the outline. They sometimes think when they are told to change this unit that some very remarkable change is desired. This is not the case, as the illustrations given in the Drawing-Book and also those given as suggestions here will show.



**To be developed.** — **Unit of design; modification of units; drawing a unit and its modification; quality of line.**

**Suggestions for Study by Pupils.** — What original arrangements did you make in Book I.? (*We made original arrangements for borders*.) How did you make them? (*We made them by repeating a figure horizontally.*) In what other way can you repeat a figure? (*A figure may be repeated around a centre.*) A figure used for repetition in decoration is called a **unit of design.**

Open your books at page 17. Look at Fig. 1. How many units are there in the figure? (*There are four units in the figure.*) What is the unit shaped like? (*The unit is shaped like a kite.*)

**Drawing-Book, *page 16.*** — **Drawing a Unit and a Modification.**

**Observation Exercises for Pupils.** — What can you say of Fig. 1 on page 16? (*It is larger than the unit in Fig. 1, p. 17, but it is of the same shape, and it has construction lines.*) What is the vertical construction line called? (*It is called the axis of symmetry.*) What part of the axis is above the horizontal and what part below? (*One third of the axis is above the horizontal and two thirds below.*) How could you obtain the point where the horizontal crosses the axis? (*I could obtain the point by trisecting the axis.*) How long is the horizontal compared with the axis? What is the proportion of the unit? (*The proportion of the unit is as 2 to 3.*)

How could you make a different unit on the same construction lines without changing the number of lines in the outline? (*I could make a different unit by changing straight lines to curves.*) If you change a straight line to a curved line on one side the axis of symmetry, what is necessary in order to make a symmetric unit? (*The opposite side should be changed in the same way.*) What change is seen in Fig. 2? in Fig. 3? What can you say about the curves? (*They are not curved a great deal.*)

**Directions.** — Two verticals are given for the axes of two units. Trisect each axis, and through the upper points of trisection draw horizontals two thirds as long as the axis. Upon these construction lines draw at the left the unit Fig. 1 enlarged, and at the right a modification of Fig. 1. Modify the outline by substituting curved lines wholly or in part for the straight lines of the printed unit. The lines may curve in or out, although they should curve but little. Practice movement for all the lines before drawing.

## EXERCISE XIII. — Decorative Design. — Units. — Arrangement around a Centre.

**OBJECT. To study a unit, and ways of modifying it; to arrange units around a centre, and complete the design by a central figure; to draw the arrangement.**

**Purpose of Ornament.** — It is desirable to consider the purpose of ornament, before undertaking even the very simple arrangement required here.

Ornament, the product of purely decorative art, is always employed to beautify objects created for some purpose, independent of decoration. It can have no independent existence, therefore, but must be subordinate to the object which it beautifies. It produces its legitimate effect when, without concentration upon itself, it makes the object to which it is applied more pleasing than if unadorned. This it can do only as an accessory, not as a principal. Hence, ornament must never be of such a character as to reduce the object decorated to a subordinate place; the ornament itself must be subordinate. Though the decoration increase the value of the object many times, yet it must be felt that the ornament is a mere accessory of the object, — that it does not exist for itself alone.

The fundamental law of ornament is subordination. This law requires that all ornament shall be modest and moderate. Strong contrasts and striking effects violate it. Illustrations of this requirement in matters of good taste in general are familiar to all. A loud voice in conversation is not excusable; a forward, self-asserting manner is a mark of ill-breeding; gaudy colors in dress are shunned; showiness, or any other attempt to attract attention, is condemned. This holds good in all ornament, whether architectural, domestic, or personal. He is not well dressed whose dress is conspicuous; that house is not well furnished where the furniture is obtrusive; that building is not well ornamented whose decoration is not ubordinate to the idea of the building.

Decoration is based upon certain principles which concern ornaments as a whole, as well as the arrangements of their parts. There are three principal ways, illustrated on page 110, in which ornament may be considered as a *whole* —

1. As a surface design, to cover a surface. Fig. 1.
2. As a border, to limit a surface. Fig. 2.
3. As a single arrangement, complete in itself. Figs. 3 and 4.

In all these illustrations, repetition, which is an almost universal feature in decorative design, is shown as follows: To cover a surface, Fig. 1; in a straight line, Fig. 2; on an axis, Fig. 3; about a centre, Fig. 4.

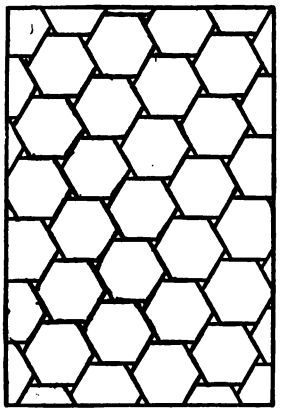


Fig. 1.

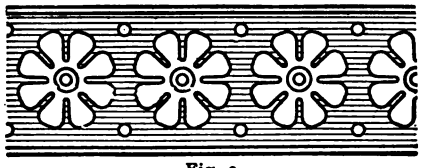


Fig. 2.

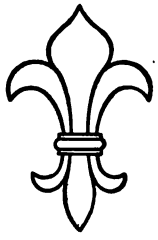


Fig. 3.

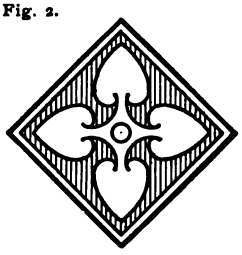


Fig. 4.

RULES FOR REPETITION OF UNITS AROUND A CENTRE.

1. Consider the nature of the enclosing figure of the ornament and its axes of symmetry. These limit the shape and number of the units. Any regular geometric figure has as many axes of symmetry as it has sides. Thus the square has four axes of symmetry, see Fig. A; the hexagon has six axes of symmetry, see Fig. B; the triangle has three axes of symmetry, see Fig. C. In an arrangement about a centre, the centre divides each axis of symmetry of the enclosing figure into two parts, each of which may be considered an axis of symmetry for the unit of design.

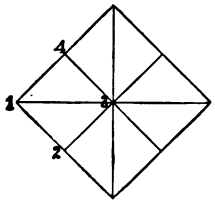



Fig. A.

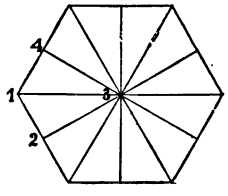



Fig. B.

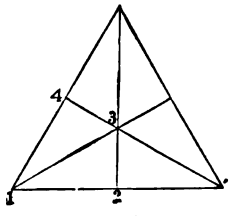



Fig. C.

2. Use complete figures for units; or lines which when repeated make complete figures. Do not use mere lines.

3. Make each unit symmetric on its axis. (This rule holds good only in elementary practice. A designer is not bound by it.)

4. Give the arrangement a strong centre; that is, make a central figure strong enough to hold together those which are arranged about it.

5. Let the arrangement of units cover two thirds of the surface enclosed.

These rules should not be arbitrarily stated to the pupils; on the contrary, the pupils should be led through comparison to reach those conclusions themselves, in the study for arrangements about a centre. They cannot of course reach all these conclusions in one lesson, but the effort should be to lead toward these results.

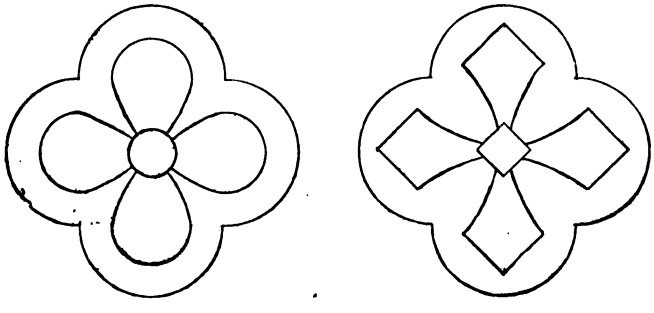
**To be developed.** — Purpose of ornament; arrangement about a centre; quatrefoil, enclosing figure; space not to be completely filled; central figure; making and drawing an arrangement; quality of line.

**Drawing-Book, *page 17.*** — **Making and Drawing an Arrangement.**

**Suggestions for Study for Pupils.** — Open your Drawing-Books. What is Fig. 1 called? What do you see within the quatrefoil? (*I see units arranged about a centre; Fig. 2 is the unit; there is also a circle in the centre.*) How many units are there? Why are there only four? Why should there not be five units? How are they placed? (*They seem to be placed so as to meet at the centre, and they do not touch the lines of the quatrefoil, — a little space is left.*) How would the arrangement look if the units touched the quatrefoil? (*It would look crowded.*) What would be the objection to that? (*It is not comfortable to be crowded, so it does not look comfortable to be crowded.*) What do you think about the figure in the centre? Why do you think it is there? (*The figure in the centre seems to hold the units together.*) As it is in the centre, what should you think it might be called? (*It might be called a central figure.*) How large should it be? (*It should be large enough to seem to hold the units firmly.*)

**Arrangement.** — How long is the axis of Fig. 2? (*It is two inches long.*) Select one of the units you drew on page 16, and cut out of colored paper four such units, having an axis of two inches. Draw the diameters of the quatrefoil, Fig. 5. Arrange the units to meet at the centre of Fig. 5, and paste them only at the centre. What does the arrangement need to look well? (*It needs a central figure of suitable size.*) Cut one like Fig. 3 or Fig. 4 and paste on the arrangement.

**Drawing.** — Draw the diameters of Fig. 6. On these diameters draw the ornament arranged in Fig. 5. Draw the units by opposites. Erase diameters and lines within the central figure. Finish. This ornament may be colored green. Green is made by mixing blue and yellow together. If pupils have had training in the use of secondary colors, a tint of red may be used.



## EXERCISE XIV. — Ornament. — Square-leaved Quatrefoil.

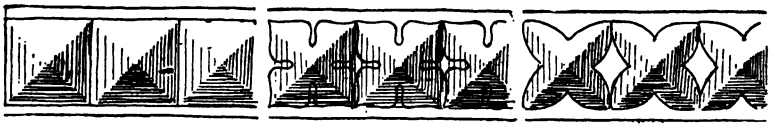
*From a Copy.*

**OBJECT. To study a simple historic ornament based on a square; to draw it enlarged.**

**Historic Ornament.** — In the past, many nations have produced certain ornament so repeatedly that the ornament has become characteristic of those nations. As the story of what a nation has done is called history, so the ornament produced by nations is called **historic ornament.** Different nations have developed different kinds of ornament; each kind, however, has a character or style of its own, hence styles of ornament are spoken of. The great historic styles are: the Egyptian, Greek, and Roman, — the ancient; the Byzantine, Romanesque, Saracenic, and Gothic, — the middle age; and the Renaissance, which may be called the modern.

**Beauty of Historic Ornament.** — Very beautiful examples of historic ornament occur in these leading styles. It is not intended at the present time to introduce any instruction on the different styles of ornament, as that would be quite beyond the capacity of the pupils. The purpose is to give beautiful examples of ornament suited to the ability of the pupils to appreciate and to reproduce. As they study a beautiful figure, and have their attention called to its pleasing curves and proportions, they learn to enjoy it; and in the effort to reproduce, the enjoyment is repeated. Great pains should be taken, therefore, to lead pupils by various analogies, recalling pleasurable things, to see the beauty in each example of historic ornament given.

**The Example.** — The ornament chosen for this exercise is from the dog-tooth molding used in early English architecture of the Romanesque style; three forms



are illustrated below. It will be seen that these are raised ornaments, coming to a point in the centre like a very low square pyramid. This resemblance to a pointed tooth occasioned its name. In the flat ornament this resemblance to a tooth cannot be seen; but as the flat ornament is the top view of the raised ornament, the name is retained. It is also called a square-leaved quatrefoil. The raised ornament furnishes an excellent example for modeling.

In drawing the example in the Drawing-Book, the beautiful shape of the leaf-like unit must be borne in mind. Each unit may be drawn separately at first, and then in finishing the figure each loop can be drawn in a continuous curve. The figure is really composed of four units which are so shaped as to make one unbroken whole. If you study a unit, you will hardly be able to detect the change from the straight to the curved. This ornament furnishes a very good exercise in cutting, as it is so easily laid out.

**Enlargement.** — Every part of a figure must be enlarged in the same proportion that the whole is enlarged. In studying a figure to see if an enlargement is well carried out, it is an assistance sometimes to observe not only the principal shapes of figures, but also the shapes of openings. This figure may be judged not only by the shapes of its units, but by the shapes of its loops.

**To be developed. — Historic ornament; square-leaved quatrefoil; repetition about a centre; curves; drawing the figure; quality of line.**

**Suggestions for Study of the Copy by Pupils.** — What is the general shape of Fig. 1? Describe Fig. 2. (*It is a square with diameters and diagonals.*) How do the diameters divide the square?

Find the upper left square in Fig. 3; what figure do you see in it? (*I see something like a leaf with a midrib, running to the corner of the square.*) How many of these figures do you find? How are they placed? (*They are placed around the centre of the square.*) Where do these leaf-shaped figures meet? (*They meet on the semidiameters.*) Do they meet in the middle of the semidiameters? (*No, they meet a little nearer to the outside.*) Are the lines that make the leaf-shaped figure straight or curved? Where is the prettiest part of the leaf? (*It is where the curve passes into the straight line.*) Can you tell why it is pretty? (*Because the curve passes so gently and seems to make one line.*) Now look at the upper side of the square, where the curves of the leaf-shaped figures meet; what shape do the two curves together make? (*They make a deep curve, a swing, a loop.*)

**Drawing-Book, *page 18.*— Drawing a square-leaved Quatrefoil.**

**Observation Exercises for Pupils.** — What is Fig. 4? How many units are repeated? How are they repeated? What is such repetition called? (*It is called repetition in a straight line.*) What kind of repetition is there in Fig. 1? (*In Fig. 1 there is repetition about a centre.*) But there is no central figure; how can it be repetition about a centre? (*You can always think of a centre.*) How do the units in Fig. 4 compare with Fig. 1? Which do you like the better? Why?

**Drawing.** — Draw a square, its diagonals and diameters, using the angles given. Place a point on each semidiameter somewhat nearer to the side than to the centre of the square. Draw each unit, studying carefully the shape of the unit. Practice movement for each curve, first on Fig. 1, and draw it. Erase diameters and the central part of each side of the square between the leaf-shaped figures. Finish the ornament as in Fig. 1, making each loop with a continuous curve, bearing in mind the shape of the unit and of the loop.

## EXERCISE XV.—Sphere on Square Prism.

MODELS: *Sphere, Square Prism.*

**OBJECT. To review the study of views; to study a combination of two models as to their views; to draw two views.**

**Review.** — It is well at the close of a half-year to give exercises that shall in some way review the work that has been done in that time. The remaining exercises in the book are therefore given to a review of the previous work. This exercise takes up again the study of views given in the first part of the book.

Hold the square prism horizontal from front to back. Place the sphere on the square prism, being careful to place it on the centre of the square prism. The front view will be represented by a circle resting on the centre of the upper side of an oblong, Fig. 1. The side or end view will be represented by a circle resting on the centre of the upper side of a square, Fig. 2.

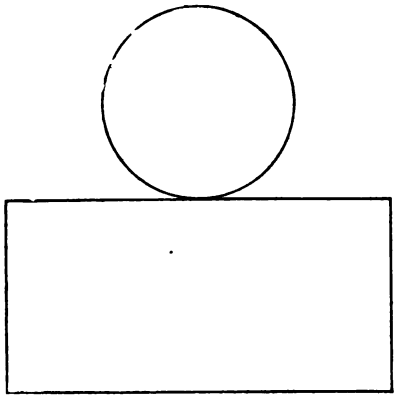


Fig. 1.

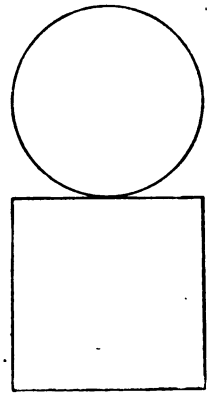


Fig. 2.

In the study of the facts of form no account is taken of the relative distance of the objects from the eye. That distance is considered in the study of appearances. In the end view of this combination, for instance, the sphere is further from the eye than the end of the square prism; but this difference in distance makes no difference in the *facts* of the height and width of the combination.

As this is a review, the lesson can be developed without spending a great deal of time. Send as many to the blackboard as possible to draw the views rapidly (but not carelessly), while those seated answer questions concerning the views; then let all draw in their books together.

In giving any lesson, try to give pupils a little outlook beyond the lesson. While developing faithfully the specific work of the exercise, try to show them in ways

suited to them that it leads out to much more than appears on the page. The sphere placed upon an upright square prism is a combination often used for posts, especially of gateways. An example is found at the fine entrance to the College Yard of Harvard University, Cambridge, illustrated below.

**Drill.** — A drill exercise is given on circles as a preparation for drawing the views of the combination. The border presents the drill in a new way.

**To be developed.** — **Review of views; facts of sphere on square prism; drawing the front and side views; quality of line.**

**Suggestions for Study by Pupils.** — Hold the square prism horizontal from left to right, opposite the eyes; on it place the sphere. What is the front view of this combination? What is the left-side view? What is the right-side view? What is the top view? What is the front view of the square prism alone? What is its proportion? How high is the front view of the sphere compared to the front view of the square prism? Where should the front view of the sphere be placed? Where should you begin to draw the front view of the sphere?

**Drawing-Book, *page 20.* — Drawing the Front and Side Views.**

**Observation Exercises for Pupils.** — Could you combine these models in any other way? Have you ever seen such a combination in any object?

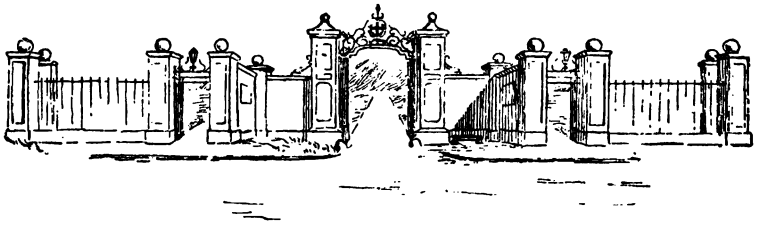
**Drawing-Book, *page 19.* — Drill Exercise. Practice for page 20.**

**Practice.** — Quadrisect the left edge of the page. From the upper and lower points draw horizontals across the page at the count of the teacher and with free movement. Trisect the upper horizontal. Beginning half an inch below the left end of the horizontal, draw a vertical downward, stopping half an inch above the lower horizontal. Repeat below the points of trisection and the right end of the line.

Drawing-Book, p 19, completed.

In each space draw a circle having a diameter as long as the vertical line. Draw marginal lines above and below the horizontals, a little less than half an inch from them.

**Directions, page 20.** — Draw the front view, using the angles given, — first the verticals, then the horizontals. Beginning at the centre of the upper side of the front view of the prism, draw the front view of the sphere. In the space at the right draw the right-end view, using the angle given.



## EXERCISE XVI. — Sphere on Square Prism. — Further Study.

MODELS: *Sphere, Square Prism.*

**OBJECT. To review appearance below the eye; to study the appearance of a group of models, also its top view.**

**Review.** — In Book I. exercises in the study of the appearance of models below the eye were given. In Book II. the appearance of models has been studied at the same time that the facts have been studied and drawn. Thus pupils have had almost constant practice in observing the appearance of objects below the eye. Special attention is now called in this exercise to the study and drawing of the appearance. This exercise will serve as a review in making a drawing of suitable size for the space it is to occupy, and in properly placing it, as well as in seeing and drawing the appearance.

**Appearance of the Group.** — Place the square prism horizontal from left to right, and on the centre of the top face place the sphere. Hold it on a level with the eye. You see the front view, — a circle resting on the centre of a horizontal oblong (see Fig. 1, page 114). Lower the group until it is at about an angle of 25° below the eye (see page 23). You notice that the top face is visible, and that the sphere seems to rest on it a little forward of the centre. You see also that the further edge of the top face of the prism appears not very high up on the outline of the sphere, and that the left and right edges of the top face seem to run toward each other, Fig. 1. Draw what you see just as it appears to you.

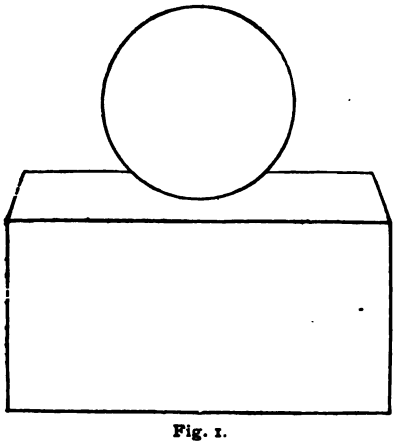


Fig. 1.

In giving this exercise to pupils, be very careful not in any way to tell them what they see. Be careful that each has an opportunity to see for himself. For the arrangement of pupils and models, see page 24.

**The Top View.** — Look directly down on the group. You see the top view, which is a circle within a horizontal oblong, the diameter of the circle being equal to and coinciding with the short diameter of the oblong, Fig. 2. If for any reason the teacher cannot give the appearance to pupils, they may draw the top view of the models.

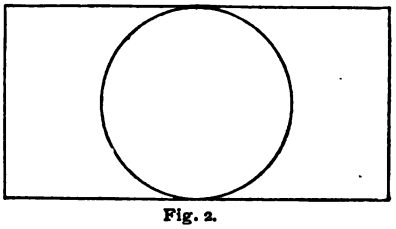
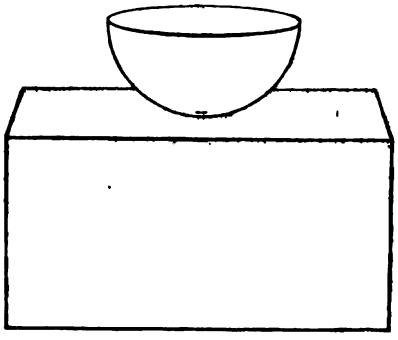
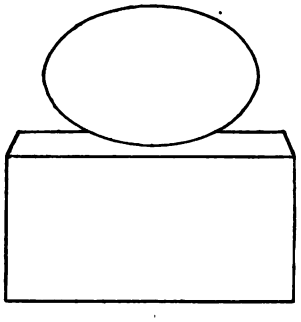
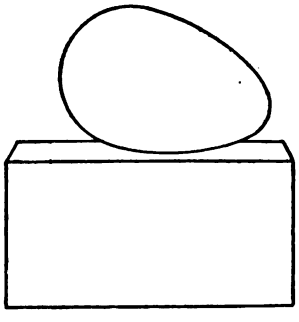


Fig. 2.

**A Hemisphere on a Square Prism. — Appearance.** — This is a more difficult study; but if it happens that pupils in previous work have drawn the appearance of the sphere on the square prism, they can undertake this group. Place the square prism as above, and upon the centre of the top face the hemisphere. Raise the group to a level with the eye. Lower it somewhat below the eye. You will see the top faces of the models appear, but they will not seem nearly as wide from front to back as from left to right. The top face of the square prism will appear a little wider from front to back than the top face of the hemisphere, although they are really equal in width from front to back. The top face of the square prism will appear wider to you than the top face of the hemisphere, because it is further below the eye. The further edge of the top face of the square prism will not appear to be very high up on the outline of the hemisphere. The left and right edges of the top face of the square prism will appear to run towards each other, and the hemisphere will appear to be a little in front of the centre of the top face of the square prism, because you are looking down on it. Follow all this with the models in hand, studying carefully their appearance. If you do not see all that has been described, try it again. You will gradually learn the difference between the facts and the appearance, and the truth of both.







**Further Suggestions.** — If the pupils have had previous training in "The Use of Models," and have thus learned to know the ellipsoid and the ovoid, either one of these solids may be placed upon the square prism, to make a group, the appearance of which pupils may draw. If circumstances favor the use of these solids, a greater variety will thus be introduced into the work.

**To be developed.** — Appearance of group below the eye; top faces appear narrow from back to front; left and right horizontal edges appear to approach each other; drawing the appearance; quality of line.

**Suggestions for Study of the Group by Pupils.** — Place your square prism horizontal from left to right. Upon it place your sphere. Where will you place the sphere so that it will look well? (*I will place it on the centre of the top face.*) Raise the group until the upper edge of the front face of the prism is on the level of the eye. Describe its front view. Lower the group somewhat. Can you see the top face? Is any part hidden? How much of the further edge is hidden? How high up on the outline of the sphere does the further edge of the prism seem to come? How do the left and right edges of the prism seem to run? Where does the sphere seem to touch the top face? If you should draw the appearance of the sphere on the square prism, how would the height and width of the drawing compare? Lower the group and look directly down upon it. Describe the top view.

**Drawing-Book, *page 21.* — Drawing the Group.**

**Observation Exercises for the Pupils.** — What can you think of that is like a sphere on a square prism? What can you think of that is like a sphere? Can you think of something like a square prism? Would it be pleasant to group them together?

**Directions.** — Consider the proportion of the drawing as to height and width. Study your space and plan for as large a drawing as would be suitable for the space. Draw the front face of the square prism. Draw the sphere. Draw the top face of the square prism. Erase that part of the further edge hidden by the sphere and finish the drawing.

If the top view is to be drawn, study its proportion and plan the space accordingly.

## EXERCISE XVII. — Leaf, from Nature.

MODEL: ***Leaf brought by each Pupil.***

**OBJECT. To study a natural leaf; to see and draw its outline.**

**A Leaf.** — Here, we are brought to the study of Nature again. A leaf is beautiful in itself, but a spray of leaves is still more beautiful, and the leaves on a tree have still another beauty. Try to have this exercise lead to more than the study of the leaf itself. Lead the pupils to speak of the trees, — the sturdiness of the trunk, the easy bending and swaying of the branches, the lightness of the leaves.

The leaves brought by pupils for this exercise should be not less than three inches from apex to base, simple in form, and not deeply divided. It would be well for each pupil to bring two or three leaves of a kind, so as to study the characteristics of a leaf in more than one example.

A leaf, perfectly developed, has three parts, — the **blade**, which is broad and thin; the **petiole**, or leaf-stalk; and the **stipules**, leaf-like parts, often found at the base of the stalk. The point of the leaf, or the part opposite the stalk, is the apex. The end of the leaf next the leaf-stalk is called the base. A good illustration of the parts of a leaf, and also of the principal toothed margins, — *serrate, dentate, crenate, undulate,* — will be found in the large plate "Margins and Parts of Leaves," belonging to Prang's Natural History Series.

The leaf chosen for the illustration in the Drawing-Book is a linden leaf. The margin of a linden leaf is toothed. In the real leaf the little teeth are quite close together. In making the picture of a leaf the teeth are only indicated now and then, as in Fig. 1 in the Drawing-Book; but although the teeth should be only suggested in a drawing, great care should be taken to retain the characteristic shape and direction of the teeth, — whether curved or pointed, whether pointing upward, outward, or downward. If the teeth were all represented in the picture, the attention would be drawn from the beauty of the general shape and of the strong curvature, and would be fixed on the details of the margin. So also if all the veins were carefully drawn, the effect of the leaf as a beautiful figure would be lost.

**Appearance of the Leaf.** — Hold the leaf facing you, with the midrib vertical; you have a front view of the leaf, and you see its whole width. Hold it with the edge toward you; you have an edge view, and you see none of the face of the leaf. Hold it still vertical, but turn it half-way toward you; the face appears to you but half its real width. Try the same changes with the midrib oblique, and also with it horizontal from left to right, and also with the midrib horizontal from front to back. Turn the leaf half-way, and also less than half-way and more than half-way. Study any picture of leaves and you will see how rarely a front view of a leaf is given. Notice the illustration at the end of this exercise.

You now begin to know some of the different aspects of a leaf. If leaves always turned their faces exactly toward us, and always had their midribs in one direction, how stiff and unpleasant a tree or a plant would be! But they turn in every direction; and so we have a thousand different aspects, with the added beauty of all the changes produced by sunlight and shadow.

The several stages of drawing a leaf are given here: Fig. 1, shape blocked-in; Fig. 2, the veins added in straight lines; Fig. 3, the curves drawn; Fig. 4, the leaf completed.

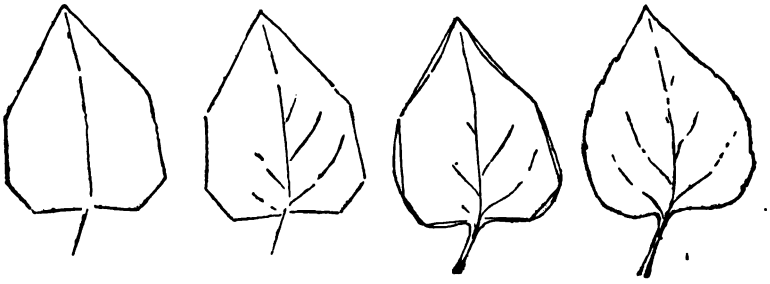


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

**To be developed. — Views; appearance; parts of leaf; stem, blade, base, apex, veins; shape, curvature; blocking-in; beauty; drawing a leaf; character of line.**

**Suggestions for Study by Pupils.** — Put your leaf on the desk and look down upon it; what view have you? Hold your leaf facing you; what view have you? How wide is it? Keep the leaf still vertical, but turn it so that you can see only an edge; how wide does it look now? Keep the leaf still vertical and turn it half-way toward you; how wide does it appear to be now? Hold it facing you with the leaf-stalk toward the left; observe and turn in the same way. Hold the leaf vertical and facing you again; turn the leaf right back; what can you see? Then turn it half-way up. How does it appear? Can you think which way the leaves grow on the trees?

What can you tell about the leaf? (*It has a stem.*) The stem of a leaf is called the **leaf-stalk** or petiole; what else can you tell about the leaf? (*There is the leaf itself.*) You mean the broad, thin part; that is called the **blade**.

Where is the apex of the leaf? Where do you think the base of the leaf is? The end of the stem next the leaf-stalk is called the **base**. What is the shape of your leaf? Is it broadest at the apex, at the base, or in the middle?

Where is the midrib? In the plantain leaf, given in Book I., there are strong ribs; in most leaves the ribs are smaller and are called **veins**. Look at the principal veins in your leaf; do they start from the base of the leaf or from the midrib?

Find the best leaf that you have, and lay it on the desk. Beginning at the apex of the leaf, with the forefinger of each hand trace around the margin of the leaf and down the stalk in sweeping curves. Trace the margin again, but this time trace with long straight lines, not more than four on a side, fewer if possible. Trace the midrib in straight lines. Trace the principal veins in straight lines.

**Drawing-Book, *page 22.* — Drawing the outline of a Leaf.**

**Observation by Pupils.** — What is Fig. 1? A linden leaf. Has any one such a leaf? Is the margin of the leaf unbroken, — that is, **entire**, — or is it notched or toothed? Which way do the teeth point, — toward the apex, toward the base, or outward? Did you ever see the teeth of a saw? How did they look? (*They looked as though they would cut.*) How do the teeth of the leaf look? (*They look soft.*) What can you do so that the edge of the leaf in your drawing will not look as though it had the teeth of a saw?

**Drawing.** — Place your leaf over Fig. 1 in the Drawing-Book. Block-in the leaf on the right half of the page; that is, draw it in straight lines, — first the left side, then the right side, adding the leaf-stalk and a very few of the principal veins, not more than three on a side, in straight lines. Draw the curves over the blocking-in lines. Erase the blocking-in, and finish in soft lines, indicating a tooth now and then and varying the width of the line.

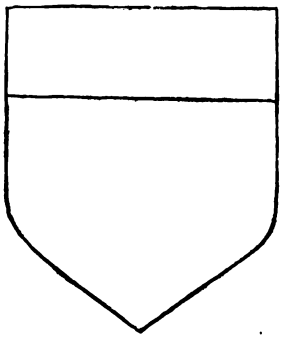
## EXERCISE XVIII. — Shield.

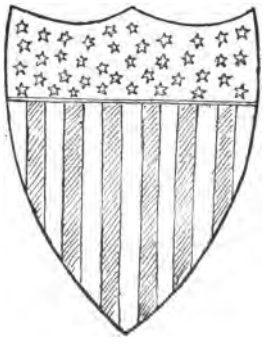
**OBJECT. To learn one form of a shield; to study its proportion and shape; to draw its outline.**

**A Shield.** — In ancient warfare a shield was borne on the left arm, to screen the body from the darts of the enemy. Shields were of different materials and of different forms. A simple French shield is illustrated below. The arms which distinguish a family or a State are now generally displayed on the figure of a shield. In the great seal of the United States, the American eagle is represented with one foot planted on a shield. This shield is frequently seen, having the upper part blue with stars upon it, the lower part bearing thirteen stripes, red and white alternating, to represent the thirteen original States. This shield is also illustrated below. It bears, like our flag, the red, white, and blue; and much of the fine description of the American flag, by Charles Sumner, which is given below, will apply to this shield: —

"There is the national flag! He must be cold, indeed, who can look upon its folds rippling in the breeze without pride of country. . . . It is a piece of bunting lifted in the air; but it speaks sublimely, and every part has a voice. Its stripes of alternate red and white proclaim the original union of thirteen States to maintain the Declaration of Independence. Its stars, white on a field of blue, proclaim that Union of States constituting our national constellation which receives a new star with every new State. The two together signify union, past and present. The very colors have a language which was officially recognized by our fathers.

"White is for purity, red for valor, blue for justice; and altogether, bunting, stripes, stars, and colors, blazing in the sky, make the flag of our country, to be cherished by all our hearts, to be upheld by all our hands."





**The Curvature.** — This figure is of very fine curvature, and is of a little more difficult proportion than any previously given. The two long curves give an oppor-

tunity for a long sweep and free drawing. This exercise can be so given as to be a great delight to the pupils both in sentiment and in drawing.

**The Spirit of the Work.** — If this figure is given to them as a symbol of our country, the drawing of the shield will partake of the inspiration. If the teacher can procure or make a large colored shield, it will add greatly to the interest and pleasure of the pupils. Even the young pupils who do not know very much what it means will feel something of the fire of patriotism, and will work with a glow that the mere figure could never awaken.

**To be developed.** — **Shield; curvature; proportion; patriotism; drawing the shield; quality of line.**

**Suggestions for Study of the Figure by Pupils.** — Open your Drawing-Books. What can you tell about the figure? (*It is higher than it is wide; the two sides are alike. It looks like a shield. I have seen one that is red, white, and blue.*) Can any one tell more about such a shield and what it meant?

Sketch the axis of symmetry on the copy. Where is the widest part of the figure? (*The widest part is at the upper horizontal.*) Trace this horizontal with your finger, and note where you cross the axis. Is the width of the figure greater or less than the height?

What is the shape of the figure? What can you tell about the outline of the shield? (*It is made of curved lines; it is not as wide at the top as at the upper horizontal line; it has three points at the top and one at the bottom.*) Where are the points at the top placed? (*One is in the middle; the two outside points are in a straight line with the middle point; they are not quite as far from the axis as the ends of the horizontal are.*)

Trace the upper curve on the left with your finger; on the right. Repeat several times. Of what does the movement make you think? (*It makes me think of a swing.*) Trace the long curve at the left side; at the right. Repeat. Of what does the movement make you think? (*It makes me think of a sweep.*) Could you cut and make a shield of red, white, and blue?

**Drawing-Book, *page 22.*** — **Drawing the outline of a Shield.**

**Observation Exercises for Pupils.** — How many inches wide is the shield? how many inches high? What is the proportion of the width to the height? (*The proportion is that of four inches to five inches,* — **4 to 5.**) How long is the vertical from the upper horizontal down? from the upper horizontal up?

**Drawing.** — Connect the points given at the right by a light horizontal. Bisect the horizontal, and bisect its left half, that is, quadrisect the horizontal. Through the middle of the horizontal draw a vertical for the axis of the shield, first deciding where to begin and where to end. Draw the shield, studying Fig. 2 for details. Practice first the movement for the curves on the copy. Draw freely and lightly. Finish in broad and soft but firm and even lines.

## OPTIONAL EXERCISE.

THE last page in the Drawing-Book may be used for an exercise on any part of the work in the book in which the teacher may think the pupils need further practice, or it may be given to an exercise in color.

**Color.** — Read with care pages 45, 60–62 on Color. The relative values of the primary pigment colors — yellow, red, and blue — can first be recalled to the pupils; that is, yellow 3, red 5, blue 8. It is supposed that pupils have already learned to recognize orange, green, and violet, and know their names.

The teacher should pin up, where all can see, three oblongs of paper of the same size, — one standard orange, one standard green, one standard violet, and observations should be made by pupils as to their values.

Questions can then be asked about the primary colors necessary to make the secondary colors, — orange, green, and violet. These colors are called secondary because they can be made by mixing two primary colors. In mixing colors which require red, use carmine or lake; vermilion is not a good mixing color.

YELLOW and RED, mixed, make ORANGE.
YELLOW and BLUE, " " GREEN.
RED and BLUE, " " VIOLET.

The arrangement of the page can be laid out according to the directions below, and the oblongs colored according to their extent.

If colors and a brush cannot be used, the page can be carried out by cutting oblongs from colored paper.

**Alternative Exercise.** — Instead of the exercise proposed, a spectrum chart can be made of twelve colors, — the three primaries, the three secondaries of the first order, and the six secondaries of the second order. The secondaries of the second order are **red orange, yellow orange, yellow green, blue green, blue violet, red violet.** The spectrum chart of twelve colors may by made by the arrangement of vertical oblongs of colored paper, two inches high, in a horizontal line in the following order, — *red, red orange, orange, yellow orange, yellow, yellow green, green, blue green, blue, blue violet, violet, red violet.**

**Observation Exercise by Pupils.** — Who will tell me something about the oblongs? (*One oblong is orange, one is green, one is violet.*) Those in the last row may answer now. In which oblong can you see the most color? Which is the brightest? Which

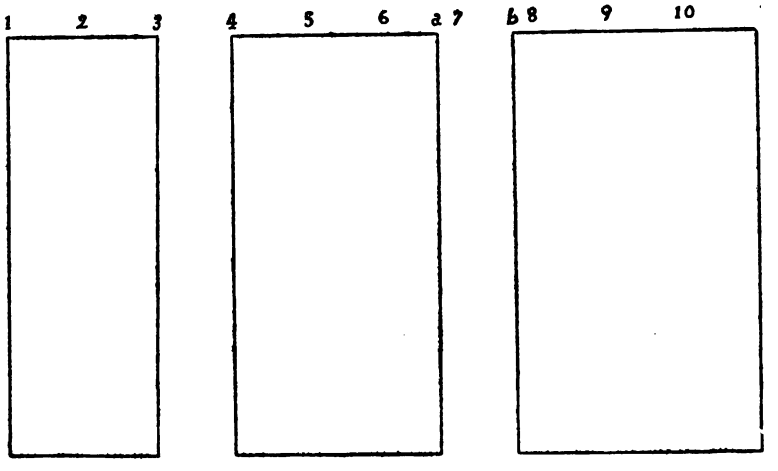
* The colored papers for these spectrum charts can be obtained of booksellers and of The Prang Educational Company. These colored papers have been prepared with great accuracy for this special purpose. Inferior colors or colors not prepared with relation to each other should not be used.

next? What can I do so that you will see no more color in the orange and in the green than in the violet? (*You can take away some of the orange and some of the green.*) From which shall I take the most? Which color do you like the best?

**Drawing-Book, *page 24.*— Exercise in Color.**

**Observation Exercise by Pupils.** — What colors would you mix to make orange? What colors would you mix to make green? What colors would you mix to make violet? We wish to have three oblongs colored orange, green, and violet. Which oblong should be the smallest? Which should be the next in size? Which should be the largest?

**Directions.** — Bisect the upper edge of the page, and an inch below the point of bisection place a point, thus dividing the page. Bisect each half, thus making four parts. Trisect each part. Mark each point of trisection. Are the spaces longer or shorter than inches? (*They are shorter than inches.*) Number these points, beginning at the left, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 Quadrisect the distances between 6 and 7 and between 7 and 8, and letter the last point in each division *a* and *b*. From points 1, 3, 4, *a*, *b*, and 11 draw verticals to within half an inch of the lower edge of the page. Draw horizontals from 1 to 3, from 4 to *a*, and from *b* to 11. Complete the oblongs by drawing the lower horizontals. Color the narrowest oblong orange, the next one green, and the last violet.



## FORM STUDY AND DRAWING IN OTHER STUDIES.

THE work in Form Study and Drawing will produce comparatively small results, unless teachers recognize its close relation to everything about us, and hence the use that can be made of it in all the elementary as well as many of the higher studies. The pupils should be constantly observing Form, and as constantly expressing it through Drawing. The teacher's work at this stage should be so laid out that Form Study and Drawing will be constituent parts of all school-work, whether Number, Geography, Language, Science, History, or Manual Training. Pupils need no urging to do illustrative work; they need only permission and encouragement. If such work is arranged so as to employ what they have learned in their regular lessons in Form Study and Drawing, the regular instruction will help the free use of drawing in other work, and the free drawing will help the regular instruction.

It is almost universally believed, at the present day, that education should begin with the concrete and lead toward the abstract. In order to begin with the concrete, the instruction must begin with things which are not only visible, but also actually tangible to the child. Such objects must be kept within his reach until he has formed fair concepts of them. In the mean time every opportunity must be given him to express those concepts, modeling being the most available means. Drawing comes next as a ready means of expression, which is also a step toward the abstract. Drawing, as the expression of ideas of things, should be used therefore constantly.

**Number.** — Objects are used to develop ideas of number. Later the pupils try to express the different combinations in number through examples of their own, which must be spoken or written. If these examples can be illustrated, the expression is less abstract, and hence more real and impressive to the child, than if merely written. If the teacher will simply start this, the pleasure of the children in this mode of expression will be so great that no further stimulus will be needed. This work should be carried on along the general lines of development in Form Study, as there can be no real drawing without a form-idea beneath it.

**Geography.** — There is no subject more intimately connected with form than geography. It deals with form from its very nature, as it is the study of the surface of the earth with all its diversities. All means of form are therefore valuable and necessary adjuncts in the study of geography. Clay and sand modeling, color and drawing, are important means in developing geographic ideas. They appeal directly to the child, and if this work for geographical purposes is made consonant with the regular work in Form Study and Drawing, it will prove very fruitful in results. The structure of the earth and its various conformations, the causes of day and night, the zones, the seasons, and vegetation will by these means become real and not mere matters of memory.

**Language.** — Teachers should continue to give pupils practice in the use of the terms and names on page 00 as well as of those given below, both in speaking and writing, always requiring *complete* sentences.

The same general plan should be followed as that suggested for Book I. (see page 64). Pupils will express themselves much more readily about something which is a part of their own experience than about the actions of another. So let them first do something with the models and then describe what they did, and then observe what another does, and then write.

**Terms of Relation, Proportion, Views.**

RELATION. — Parallel, perpendicular.

PROPORTION. — 1 to 2, 2 to 1, 4 to 2, etc.

VIEWS. — Left-end view, right-end view, bottom view.

**Names of Models, Objects, Arrangements, and Details.**

SPHERE: round face.

CYLINDER: curved face, plane face.

SQUARE PRISM: parallel faces, perpendicular faces.

OBLONG: diameter, diagonal, semidiameter, semidiagonal.

ARRANGEMENT: axis of symmetry, unit of design, central figure; square-leaved quatrefoil.

POTATO, SQUASH: eyes, ribs.

LEAF: blade, petiole, stipule; base, veins; entire margin.

COLOR: orange, green, violet.

**Manual Training.** — The first considerations must be the materials which the pupils are able to handle at this stage, and the processes which they are able to execute.

The following suggestions are made: —

Materials: clay; scissors, pencil, rule; paper, pasteboard; weaving-needle, sewing-needle, thimble, thread, sewing-silk, worsted; cloth, leather, basket-material.

Processes: modeling, weaving, folding, cutting, pasting, sewing.

There are few schools in which the conditions are such that all these processes can be carried out. It may prove quite possible, however, in many schools to carry out one or two lines of this work. As all of this work, however, depends largely on Form Study, it is important that its development should be made parallel with that in Form Study. A manual for such work, developing it on even lines of progress with the Form Study and Drawing in Prang's Complete Course, is now in preparation.

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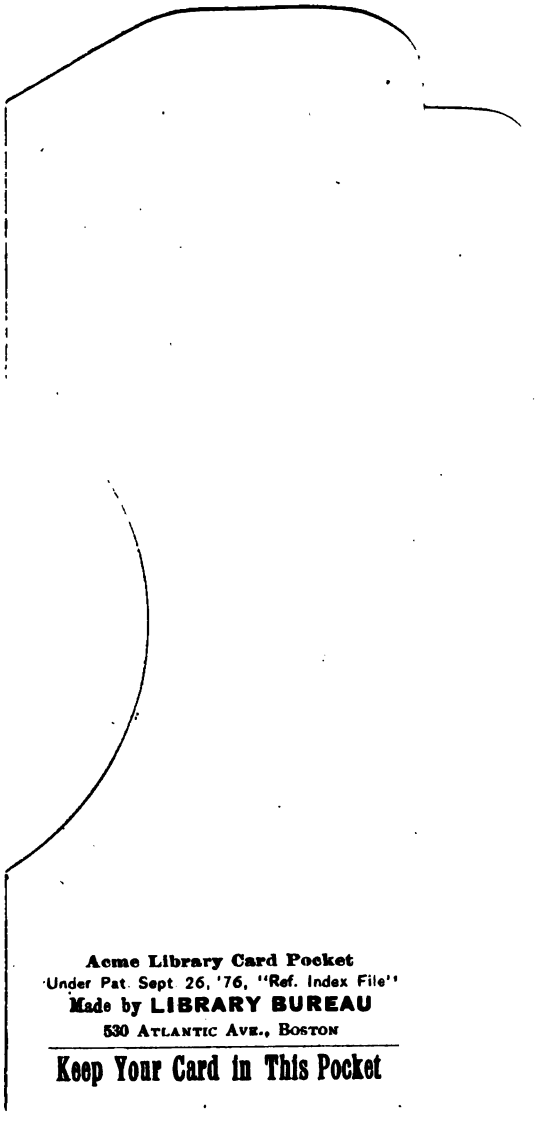

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